

"New Developments in Survey Methodology" Seminar Series

Seminar 1: "Four different reasons why one will find two factors for a one dimensional concept"

Date: October 29, 2010, from 11h00-13h00.

Place: Universitat Pompeu Fabra. Edifici Roger de Llúria, room 40.008. Carrer de Ramón Trias Fargas 25-27 (metro Ciutadella - Villa Olímpica). Barcelona, Spain.

Further information: If you have any questions about the seminar, please contact us at recsm@upf.edu.

Introduction:

Already in 1956 Luis Guttman suggested that one will get a two factor solution in case of one dimensional concepts like competences. For example language competence requires that one can recognize letters, words, sentences, paragraphs and finally texts as a whole. The higher level of competence always requires the lower competences but some extra capability. Such indicators for the competence form what has been called a cumulative scale and the correlation matrix of these items in the specified order will indicate that the items which are close together correlate highly with each other while distant items will correlate rather low. We will call this structure of the matrix a simple structure. If such a correlation matrix is analyzed, one will get a two factor solution even though the concept is one dimensional.

Such correlation matrices can also be found for one dimensional attitudes. If one orders the items with respect to the underlying dimension one will often find a simplex like structure in the correlation matrix. However the cumulative character of the items is not the only explanation for such correlation matrices. In this seminar we will discuss three different alternative explanations for such matrices. Two are substantive explanations and one explanation is a methodological.

Because the interpretation of the data, that there are two factors needed to explain the data, is wrong, we draw the attention to this problem.

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Speakers:

Prof. Dr. Ákos Münnich (University of Debrecen, Hungary). Prof. Münnich holds a PhD in Mathematics from Kossuth Lajos University (Hungary) and a PhD in Social Sciences from the University of Amsterdam (the Netherlands). At the moment he works at the University of Debrecen (Hungary), where he is Director of the Institute of Psychology, Head of the Department of Social and Work Psychology and Head of the Methodology and Psychometrics Research Group. Prof. Münnich is an expert in psychometrics and the application of mathematical models in psychology, and is also interested in measurement theory, survey methodology and neural modeling. He has published in *Mathematical Social Sciences* and the *Journal of Mathematical Psychology*, among other journals.

Prof. Dr. Wijbrandt van Schuur (University of Groningen, the Netherlands). Prof. van Schuur studied political science at the University of Amsterdam, and works since 1975 at the University of Groningen (Netherlands), first as a psychometrician, and since 1989 in the sociology department. His dissertation "Structure in political beliefs" (1984) combined the development of the ordinal unidimensional unfolding model and the application of it to beliefs of middle level elites of 48 parties in twelve countries of the European Union. The unfolding model was further developed into a model for the measurement of circular latent variables ("circumplex"), and more research has been done on European and Dutch party members and party elites, often in partnership with the Documentation centre Dutch Political Parties in Groningen. He also published on the measurement of political knowledge. His most recent publication is a monograph on Ordinal Item Response Theory (also known as 'Mokken scaling'), in press with Sage.

Prof. Dr. Willem E. Saris (RECSM - Universitat Pompeu Fabra, Spain). Prof. Saris studied Sociology at the University of Utrecht and received his PhD from the University of Amsterdam in 1979. He became full professor in political science in 1983, specializing in the methodology of the social sciences. At the moment he is director of the Research and Expertise Centre for Survey Methodology (RECSM) at the Universitat Pompeu Fabra. His main specializations are structural equation modeling and the methodology of survey research. As a member of the central coordinating team of the European Social Survey he became laureate of the Descartes Research Prize in 2005 for the best scientific collaborative research. In 2009 he received the Helen Dinerman award from the World Association of Public Opinion Research, in recognition to his life long contributions to the methodology of public opinion research. He is the president and founder of the European Survey Research Association.

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Abstracts:**One or two factor? - Or something else?**

Ákos Münnich (University of Debrecen, Hungary)

Factor analysis on a correlation matrix with simplex structure results a two factor structure. Many times, in practice we apply factor analysis for one dimensional concepts and expect a solution with one underlying factor, but the result is an unexpected two-factor structure. Using the correlation matrix and factor analysis basically assumes that our variables are linearly related, in spite of the fact that this assumption is sometimes unrealistic. It is also assumed that the parameters of the factor analysis model are the same and valid for every individual in the population (except from some random error).

In the presentation we will argue for using individual models for measuring subjective evaluations (attitude), and by some specific models, we discuss the importance of the question: when a model parameter can be/can not be regarded constant over the population. We demonstrate by examples that using subjective reference point in the model may also result a correlation matrix with simplex structure. We then discuss the consequences and the general relevance of using factor analysis in measuring attitudes.

The unfolding model as an alternative explanation for finding two factors for a one dimensional concept.

Wijbrandt H. van Schuur (University of Groningen, the Netherlands)

The unfolding model is an Item Response Theory model in which subjects give the highest response to an item that is represented closely to their own position on a latent continuum, and decreasing responses to items farther away from their own position, either to the left or to the right of it. Examples can be found in analyses of optimal preferences: a subject has a high probability of voting for a party that is close to him in political ideology, but a lower probability if that person is either more conservative or more liberal (in the American sense of the word) than that party. If we order political parties from left to right, then probability scores for adjacent parties will correlate highly positively. These correlations decrease with increasing distance between the parties, and can become negative for parties at different ends of the political spectrum. A factor analysis of such a correlation matrix will give two factors. Another example is the bipolar localism- cosmopolitanism construct.

Literature:

Schuur, W. H. van (1993). Nonparametric unidimensional unfolding for multicategory data. *Political Analysis*, 4, 41-74.

Schuur, W.H. van & Kiers, H.A.L. (1994). Why factor analysis often is the wrong model for analyzing bipolar concepts and what model to use instead. *Applied Psychological Measurement*, 18, 97-110.

Variation in response functions as an alternative explanation for finding two factors for a one dimensional concept.

Willem Saris (Universitat Pompeu Fabra, Spain)

We are in general aware of the fact that people express themselves differently. We know that some people use overstatements and other overstatements. In survey research terms this means that some people use more extreme categories to present their opinions and other use more the middle categories of the scale for the same opinions. We have called this “variation in the response functions” and demonstrated that this phenomenon can be observed in research.

The consequence of variation in response functions is that items that are close together on an underlying dimension of a unidimensional concept will correlate higher with each other than items that are further apart on this dimension. The latter can even negatively correlate. This means that variation in response functions can be an explanation for simplex like correlation matrices for items of a unidimensional concept and so also for the two factor solution which is often obtained for unidimensional concepts.

Literature:

W. E. Saris (1988) Variation in response functions: a source of measurement error in attitude research. Amsterdam, SRF.