STRUCTURAL EQUATIONS WITH LATENT VARIABLES AND SOCIAL REPRESENTATIONS: COMMENTS ON CARUGATI, SELLERI AND SCAPPINI

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Abstract: Utilisation of structural equations with latent variables is one promising strategy for social representation theory development. Carugati, Selleri and Scappini (1994) present an operationalization of their three level structure theory of social representations using a confirmatory factorial analysis. Some points concerning which strategy would be more heuristic in order to develop social representations theory with Lisrel techniques are developed. In particular the distinction between exploratory and confirmatory analysis is discussed. Finally, some remarks are made about statistical assumptions concerning measures in structural equation models within the field of social representation studies which need to be clarified.

In their article, Carugati, Selleri and Scappini (1994) propose two notions within social representations theory; the conceptions which are defined as «the results of any first-level treatment of subject's answers, in search of a latent organisation of empirical indicators»and theories which are the relationships among the conceptions people hold. Hence, three hierarchical levels are distinguished: empirical indicators, conceptions and theories. This three level cognitive structure is defined as the general form of social representations. A higher-order factor model is postulated and tested using Mugny and Carugati's (1985) data on the basis of structural equations with latent variables (SELV[1]). Different tests are produced in several subsamples in order to examine the social anchoring of the social representations of intelligence in different social categories.

My comments on this paper will focus on three questions: (1) is testing a unique model a heuristic strategy for social representation theory development?, (2) are Lisrel techniques a guarantee of confirmation?, (3) to what point are Lisrel techniques flexible?[a]

1. I will use SELV and Lisrel as synonyms.

Is testing a unique model a heuristic strategy for social representation theory development?

The first and maybe the most important point to discuss is the theoretical assumption that social representations are best described by a three level hierarchical structure. At present, social representation theory is developing itself in different directions (see for example Breakwell & Canter, 1993; Jodelet, 1989). This disparity of theories, and sometimes even a lack of definition of the nature of social representations, has been a cause of a lot of criticisms and scepticism about social representation theory (Farr, 1987; Jahoda, 1988, McKinley & Potter, 1987; Potter & Wetherell, 1987). Nevertheless, modelling social representations as structures is nowadays one of the most common approach (Guimelli, 1994) and may become one answer to this problem of definition. In this respect, Carugati et al.'s paper is valuable because it is a tentative to develop and to operationalize a precise structural conception of social representations.

My questions are not linked to problems of definition in a strict sense, but more to the different strategies which can be used to defend a model. For example, Carugati et al., after having presented their definition of social representations, have chosen to test their model in different samples. Wouldn't it be more heuristic to test their model against other models derived either by different theories or included in their own theory?

Maybe it would be more informative, taking account of actual development of social representation theory, to test different models of social representations before defending one or another model. It is true that there have been few tries to compare empirically different structural models of social representations but it is maybe one work we should undertake in the next future. For example I would find interesting to compare Carugati et al.'s model with other structural models of social representations, as for example the theory of central nucleus (Abric, 1989; Flament, 1989) or the theory of organising principles of interindividual differences (Clémence, Doise & Lorenzi-Cioldi, 1994; Doise, 1990).

These reflections are also based on the possibilities offered by SELV. I will try to show that Lisrel techniques have, as any statistical tool, some characteristics we should take in consideration.

Are structural equations with latent variables a guarantee of confirmation?

Carugati et al. (1994, p.142) claim that confirmatory factor analysis (which is a special case of the general model of structural equations with latent variables, Bollen, 1989) is a resisting and strict test of models. This is true and not true.

As developed by Bollen (1989, chapter seven), the distinction between exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) refers to ideal types, with most applications falling between these extremes: «For instance, researchers using traditional EFA procedures may restrict their analysis to a group of indicators that they believe are influenced by one factor. By doing so, they test an implicit if not explicit model. Or, researchers with poorly fitting models in a CFA often modify their model in an exploratory way with the goal of improving fit (p.228)» (concerning EQS see also

Echabe & Castro, 1993, p.30). In fact, we may consider that there are three distinct uses of SELV that can be placed in a continuum having exploration and confirmation as poles.

1. The more restrictive and confirmative approach would consist in having only one theoretical model and test it with SELV. In this case, *all* links between the variables should be defined a priori. If the model fits the data, it is confirmed, if not it can be rejected.

2. The intermediate situation is one in which more than one model is assumed theoretically or in some cases from data results. In this case, SELV are used to compare the models and decide which is the most plausible.

3. The exploratory approach consists in taking a set of variables with some theoretical assumptions on the links between the variables. Then, by using the indices of modification given by Lisrel, it is possible to build, with an iterative procedure, a model which will in the best case fit the data and be interpreted on theoretical basis. This procedure is exploratory, because the model is extracted from the data a posteriori and not a priori from theory.

In summary, SELV are not a guarantee of confirmation. Only the link created by the researcher between theory and data can be considered as such. In this respect, I am not sure to understand Carugati et al.'s purpose. In their introduction they present their model as one model which has to be tested. Hence, I had the impression that CFA was used as a confirmative approach. If this is correct, I would have some remarks and questions.

Firstly, the model is not presented completely in the theoretical introduction. Only the general form (a higher-order factor model) is given, but no precise hypothesis are made about: (1) the associations between the variables and the factors, (2) the associations between the factors of the first level and of the second level, (3) the associations between the factors of the second level. Secondly, as the degrees of freedom are different when comparing the results, it seems that different models have been used to test the hypothesis. Were the models suggested a posteriori by data analysis or a priori by theory? For example, comparing figure 1 and figure 4, we see that the two models have different degrees of freedom. This is probably due to the fact that the association between the GIFT factor and the SOCINT factor is probably not considered in the second case because it is not statistically significant. Can we consider these two models as equivalent? If the intention is to test one model in two samples, the link between the two mentioned factors could be tested in both analysis even if it is not statistically significant in one case. Using SELV, I would suggest that it is useful to distinguish and present clearly, on the one hand, the model which should be the result of an a priori definition on the basis of theory (at least when confirmation is intended) and, on the other hand, the statistical results obtained for each association which are based on data. This is not the only example, the same remark can be applied to the definition of the SOCINT, why is PRESS factor not always linked to SOCINT factor? I think that in a confirmatory approach these links should be defined a priori. Otherwise we are in an exploratory approach.

To conclude these remarks I must return to my first question: wouldn't it be a better strategy, instead of (or in addition to) comparing models in different samples, to test the three level model against other models, for example simply the baseline model and a two level factorial model? Or, as suggested above, with other models being built on different theories of social representations? I think an intermediate approach, between confirmation and exploration would be more informative to develop social representation theory and

more adapted to Carugati et al. purpose. Of course this suggestion should be discussed further.

To what point are Lisrel techniques flexible?

Another issue, which is maybe less important on a theoretical debate, but which could become essential as researchers will probably use more and more SELV in the field of social representations concerns the statistical use of Lisrel techniques.

Lisrel is a powerful and flexible technique, but it is my opinion that some basic rules should be followed. I agree with Carugati et al. to say that indices of fit are actually a matter of interpretation and that we have to give more than one index of fit in the result presentation (see for example Bollen & Long, 1993). I could also discuss the problem of sample size which may be arisen for the models which are tested with few subjects (see figure 3, p.141). Bollen (1989, p.268), for example, suggests to have at least several cases per free parameter (a ratio of 5 subjects per free parameter is suggested by Bentler & Chou, 1988).

I would be more hesitating about two points I would like to emphasise. Firstly, I was surprised that the models presented by Carugati et al. do not include errors in the variables measurement as it is generally admitted for attitude measures. Is this just not indicated in the figures or is it based on theoretical considerations? Secondly, I have observed that the factors are not scaled as it is usually recommended (see Bollen, 1989, chapter 5). Jöreskog (1979, p.308) for example states that: «In order to assess the causal effects it is necessary that the units of measurement in the latent variables be defined in a natural way. This can often be done by specifying the unit of measurement to be the same as one of the observed variables». It is not clear what is the procedure which was used by the authors if they used another way of estimation of parameters (standardization of solutions for example).

These two points are important, because they are directly linked to problems of validity and reliability of measures. They are also important because adding measurement errors and scales to the factors, Carugati et al.'s model would be under underidentified (at least three, and better four parameters are necessary to estimate a latent variable, see Bentler & Chou, 1988), and this would mean that new items should be included in the study or that a new study should be undertaken.

Concluding remarks

I have written these comments because I think that SELV will become a useful tool in the future within social representation field. In this respect, Carugati et al.'s work is a welcome first step toward a structural theory of social representations. Nevertheless my comments were formulated in order to extend the dialogue making two suggestions when using SELV for testing structural models of social representations.

The first proposal is to distinguish clearly exploratory studies and confirmatory studies. As developed in this paper, SELV are not a guarantee of confirmation. Only a priori models may be tested in a confirmatory way. If the model is extracted from results, it must be considered as exploratory. In this respect it is suggested that studies comparing different models may be a heuristic strategy for social representation theory development.

The second proposition is to include measurement errors and scales to latent variables in the models, at least when no «objective» measure exists, which is the most habitual situation in social representation studies.

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