# Notes on Latent Variable Modeling

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## Introductory Notes

The Ideal experiment: a single independent variable is manipulated, and the consequences are observed in a single dependent variable.

Experiments in reality : the variables which are observed are typically not the one of real theoretical interest but are merely some convenient variables acting as proxies. A full analysis will turn out to be multivariate, with a number of alternative experimental manipulators on the one side, and a number of alternative response measures on the other.

There is a variety of statistical techniques for dealing with situations in which multiple variables, some of which unobserved, are involved. In [1] are discussed a variety of methods with the following common features:

( a ) multiple variables – three or more - are involved

( b ) one or more of these variables are unobserved i.e. *latent*

*Latent variable analysis*, discussed in [1], encompasses specific methods such as factor analysis, path analysis and structural equation modeling applied to (a) and (b).

### Path Models in Factor, Path, and Structural Equation Analysis

#### Path Diagrams

*Path diagram* is a representation of the relationships among a number of variables. We use capital letters to denote variables in such diagram. The connection among variables are represented in path diagrams by two kinds of arrows : a straight, directed arrow represents *a causal relationship* between two variables, while a curved bidirectional arrow represents *a correlation* between the variables which it connects.

Figure 1: example of a path diagram

Variables A, B, and X are all assumed to have causal effects on C.

## References

[1] [Latent Variable Models: Introduction to Factor Analysis and Structural Equation Analysis, John C. Loehlin, 2004](https://github.com/dimitarpg13/information_theory_and_statistical_mechanics/blob/main/literature/books/Latent_Variable_Models_Loehlin_2004.pdf)