Modeling heterogeneity in growth models

Abstract of habilitation thesis

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The thesis deals with growth curve models in psychology focusing on the various ways in which individual differences in developmental trajectories may be modeled. The first chapters introduce growth curve models within the generalized mixture-model framework and within the structural equation modeling framework. Special attention is paid to the specification and interpretation of the stochastic part of the models which captures both systematic individual differences and random factors affecting the modeled characteristic on several levels. The range of growth models includes higher-order latent growth models that incorporate the measurement model into the growth model allowing us to explain part of observed individual differences in developmental trajectories by the substantial imperfections of measurement.

Two approaches to modeling heterogeneity are explored – predicting growth parameters by measured variables implied by theory and empirical, exploratory search for internally homogenous subpopulations, i.e. latent growth classes and growth mixtures. The former approach is described only briefly as it is well established in psychological research and the focus is on the latter one. The second part of the thesis describes the process of exploring latent growth classes and growth mixtures from the specification of the growth and residual structures, the estimation and interpretation of model parameters and model fit, and deliberating the optimal number of latent classes, to incorporating covariates to the model in an effort to better understand the character of latent classes suggested by the models.

The rest of the thesis provides two detailed practical examples of latent growth and growth mixture analyses using Mplus software supported by R. The first is a series of analyses of the development of substance abuse in adolescence from age 13 to 19. Up to four manifest measurements are modeled using 10 different growth models which are then subjected to latent growth and growth mixture analyses. The second is a series of analyses of the development of self-reported autonomy over the period of emerging adulthood. Up to thirteen measurements over the period between 18 and 28 years are modeled as linear and non-linear growth curve models with various residual structures. The individual variance in growth in these models is then explained by latent growth classes to show the interaction between growth model specification and the range of possible specifications of latent classes explaining growth and residual variance. Second-order latent growth and growth mixture analyses are presented in detail, too. In both examples visualizations of latent growth classes are shown as an important aid in interpretation. Mplus and R code for all models are available in the appendices.

Both theory and examples point to the importance of a theoretically meaningful specification of residual structures of growth models. This then enables the analyst to make meaningful decisions about which variance parameters should be allowed to differ across latent classes or mixture components – which is what defines the interpretational potential of the classes/components suggested by the analysis.

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