

## **Abstract**

The aim of this dissertation is to develop an adequate multivariate representation of individual differences in cognitive abilities in old and very old age. Such a representation should allow an investigation of the internal structure of cognitive abilities as well as their relations to external variables. The history of individual differences research on the structure of cognitive abilities provides a number of possible factor models, from single-factor to orthogonal or oblique common factor models and hierarchical representations with general and specific ability factors. Because the factor space tends to dedifferentiate with age, it was of special interest to evaluate the relative importance of general and specific factors of cognitive functioning in old and very old age. Goodness-of-fit, communalities of the factors, the degree to which the factor space represents age-associated variances adequately, and the prediction of external criterion variables were used as criteria for the evaluation of different possible models. Technical problems with the kind of hierarchical models often used in cognitive aging research indicated the need for a different model representation. By means of simulations, it was shown that these existing models are prone to produce biased results. An alternative representation of general and specific factors—the *nested factor model*—is investigated in this dissertation, together with its conceptual and methodological background in individual differences research on cognitive abilities. In addition, different ways of introducing the age variable as a predictor or covariate of individual differences are discussed.

In the empirical part, data from the Berlin Aging Study were used to investigate the importance of specific group factors in old and very old age and to demonstrate the utility of the nested factor model for examining several empirical questions of cognitive aging research emanating from the interest in specific factors. First, the dimensionality of individual differences in cognitive functioning in old and

very old age was investigated by comparing the communalities of general and specific factors in different age groups. Second, by projecting the age variable into the measurement space, it was investigated how well age-related differences were represented in the different models. Third, using external criterion variables from the domains of educational background, personality characteristics, and everyday cognitive functioning as external criteria, the importance of considering specific sources of variance to describe the interplay of these domains with cognitive abilities was examined. Results showed that a general factor alone could not adequately explain the multivariate picture of cognitive aging. Specific group factors were necessary to fully represent individual differences in cognitive functioning, multidirectional age-associated effects, and relations to external criterion variables in old age.