To understand the complex relations among cognitive and academic abilities, it is necessary to measure constructs with many indicators. Measurement models should reflect that cognitive ability scores are influenced by many factors. Failure to account for small cross loadings in the measurement model can lead to serious distortions in the structural model. Among other measures, each examinee was administered a substantial portion of the WJ III Cognitive and Academic Batteries and a full WAIS-III $n = 1040$ or WAIS-IV $n = 252$. A database of 865 complete cases was used in this study. The mean WAIS FSIQ for this sample fell in the high average range ($M = 112.09, SD = 13.59$).

Archival data were obtained from a large Midwestern university at which comprehensive evaluations are provided at no additional fee. Among other measures, each examinee was administered a substantial portion of the WJ III Cognitive and Academic Batteries and a full WAIS-III $n = 1040$ or WAIS-IV $n = 252$. A database of 865 complete cases was used in this study. The mean WAIS FSIQ for this sample fell in the high average range ($M = 112.09, SD = 13.59$).

A bifactor model was used to estimate the separate effects of $g$ and other abilities. Because an exploratory approach was used, the final SEM model fit well ($CFI = 0.93, RMSEA = 0.044$). Many of the WAIS and WJ tests are complex mixes of many abilities. Psychometric $g$ and $Gc$ were strongly related to nearly all academic abilities. $Gwm$ predicted basic academic abilities and $Gs$ predicted academic fluency measures. More basic academic skills tended to predict more complex academic skills.

Although it is universally assumed that the relations among cognitive and academic abilities are complex, few data sets have enough indicators to model this complexity properly. Consistent with information processing models, we present a model of academic abilities that allows more complex skills (e.g., reading comprehension) to be partially dependent on more basic ones (e.g., reading decoding). Implementation of this model in clinical settings could be achieved using specialized software.