**G-loading**

Three levels of Stratum:

IQs are indicators of *psychometric g*, the hypothetical source of individual differences across all cognitive tasks.

* Carroll (1993) demonstrated consistent evidence for least three levels of cognitive abilities that vary according to their generality (Schneider & McGrew, 2012). In Carroll’s model, psychometric *g* is positioned at the apical and most general level, stratum III.
* Abilities associated with broad categories of task content (e.g., verbal content and visual content) or cognitive processes (e.g., reasoning processes and short-term memory processes) compose Carroll’s stratum II, and
* narrowly focused abilities associated with small subsets of cognitive tasks (e.g., requiring provision of word meanings or completion of pictorial analogies) compose stratum I (Schneider & McGrew, 2012).

The effect of psychometric *g* on any variable can be measured as a *g loading*, a standardized coefficient with a hypothetical range from .00 (indicating no relation) to 1.00 (indicating a perfect relation). Interpretation guidelines indicate that *g* loadings of .70 or higher can be considered strong (Floyd, McGrew, Barry, Rafael, & Rogers, 2009; McGrew & Flanagan, 1998).

Tests also differ in their g-loading, which is the degree to which the test score reflects general mental ability rather than a specific skill or "group factor" such as verbal ability, spatial visualization, or mathematical reasoning). g-loading and validity have been observed to be related in the sense that most IQ tests derive their validity mostly or entirely from the degree to which they measure g (Jensen 1998).

The ***g* factor** (short for "general factor") is a construct developed in [psychometric](http://en.wikipedia.org/wiki/Psychometric) investigations of [cognitive abilities](http://en.wikipedia.org/wiki/Cognitive_abilities). It is a variable that summarizes positive correlations among different cognitive tasks, reflecting the fact that an individual's performance at one type of cognitive task tends to be comparable to his or her performance at other kinds of cognitive tasks.

The existence of the *g* factor was originally proposed by the English psychologist [Charles Spearman](http://en.wikipedia.org/wiki/Charles_Spearman) in the early years of the 20th century. He observed that children's performance ratings across seemingly unrelated school subjects were positively correlated, and reasoned that these correlations reflected the influence of an underlying general mental ability that entered into performance on all kinds of mental tests. Spearman suggested that all mental performance could be conceptualized in terms of a single general ability factor, which he labeled *g*, and a large number of narrow task-specific ability factors.

Mathematically, the *g* factor is *a source of variance among individuals*, which entails that one cannot meaningfully speak of any one individual's mental abilities consisting of *g* or other factors to any specified degrees. One can only speak of an individual's standing on *g* (or other factors) compared to other individuals in a relevant population.

**Omega-squared**

McDonald has referred to these estimates as *coefficient omega.* In terms of classical test theory, omega is both a reliability and validity index because it is the true score variance in the composite that is attributed to a common factor (Bollen, 1989; Gustafsson & Åberg-Bengtsson, 2010). Omega is a general estimate and may be used to determine the saturation of one factor (e.g., *g*) in a composite even when there are multiple factors (e.g., *g* and group factors) contributing to the composite, and it may also be used to calculate the saturation of all of the factors contributing to the composite.

The  (hierarchical) coefficient gives the proportion of variance in scale scores accounted for by a general factor (1,2)

EFA: One way to find  is to do a factor analysis of the original data set, rotate the factors obliquely, factor that correlation matrix, do a Schmid-Leiman transformation to find general factor loadings, and then find . Here we present code to do that.

**Omega-calculation**

* First,  was calculated as the square of the sum of subtest *g* loadings divided by the total variance in the subtest scores includedin the composite (Gustafsson, 2002). This estimate represented the proportion of variance in the global composite that was accounted for by *g*. The square root of  represented the correlation between the composite score and latent *g*, which is the *g* loading for the composite (McDonald, 1999).
* Second,  estimates were calculated; these estimates were based on all of the common factors in the nested factor model, including *g* and the other first-order group factors. The sum of subtest *g* loadings squared, and the sum of each group’s factor subtest loadings squared, were summed and divided by the total variance in the subtest scores.