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Process overlap theory: A cognitive theory of the general factor of intelligence

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Performance on diverse cognitive tests always correlate positively. This is called the positive manifold, which can be statistically accounted for by a general factor, g. g is usually identified with a domain-general cognitive ability. An alternative explanation, process overlap theory (POT) assumes that any item or task requires a number of domain-specific as well as domain-general cognitive processes. Domain-general processes involved in executive attention are activated by a large number of test items, alongside with domain-specific processes tapped by specific types of items only. Besides the positive manifold, the theory accounts for a number of other phenomena, such as the higher across-domain variance in low ability groups (differentiation). Process overlap theory is translated to a multidimensional item response model, abridging psychometrics and cognitive psychology. Simulations based on the POT model (i.e., without positing a unitary ability) confirm that such data fit a higher-order general factor model. Hence the ability to extract g does not imply that g has any causal effect on cognitive test performance.

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