MODELING REACTION TIME DISTRIBUTIONS INCREASES THE STATISTICAL POWER OF COGNITION TESTING

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ABSTRACT

Drug development clinical trials often use computerized cognitive tasks to assess participants' cognitive performance during individual testing sessions. The sessions, designed to measure cognitive dimensions such as psychomotor function, attention, visual learning and working memory, collect subjects' responses as reaction time (RT) and accuracy and report subtest scores (e.g., mean RT) that are then used to quantify cognitive performance. Over the past 2-10 years, Bayesian estimation using either a Gaussian or Wiener diffusion model of reaction time (RT) has become increasingly effective and used in drug development as an approach to model individual subject's RT distributions and estimate parameters of interest. The recent evidence looking at model fit shows that a single performance metric and improved analysis methods may increase the statistical power to test specific hypotheses of cognition in clinical trials.

METHODS (cont.)

• To test whether RT distribution models (ex-Gaussian and Wiener Diffusion Models) as compared to single performance metrics and improved analysis methods may increase the statistical power to test specific hypotheses of cognition in clinical trials.

• Reaction time (RT) estimates were extracted from subacute reaction time data during the Cogstate battery, a widely used computerized cognitive test.

• Cognitive tests consisted of Detection (assaying psychomotor function), Identification (assaying attention), One-Card Learning (visual learning) and One-Back (assaying working memory). Note that the One-Back test was not included in the current investigation because no healthy controls were available for this task. Because the Cognitive Function Test (CFT) battery uses a single explanation of variance, the diffusion model is not identifiable. Therefore, the method described was utilized for this task. Aforementioned Cognitive data from the identification of schizophrenia or bipolar depression were compared to normative data obtained from healthy subjects.

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