

How Reliable Are Reliable Change Methods Across Multiple Time Points?

PS 5:7

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BACKGROUND

- Serial assessments are increasingly used in outcomes research to document abnormal changes in cognition.
- Methods such as the Reliable Change Index (RCI) and Standardized Regression Based (SRB) approaches have been developed to assess reliable test-retest change that attempt to control for practice effects, measurement error and regression to the mean.
- However, applications of these reliable change methods have largely been limited to test-retest situations.
- Longitudinal studies often involve serial assessments involving 3 or more evaluations to document abnormal or unusual **rates** of change over time.
- It is not clear whether reliable change methods such as SRB can be extended to predict performance across multiple time points.

OBJECTIVES

- To evaluate the reliability of group-based SRB methods to predict successive serial retest performances on the Symbol Digits Modality Test (SDMT) across 5 time points spanning 22 months.
- To apply SRB methods on an entirely ipsative basis to subjects' SDMT data and compare the individual versus group-based outcomes for predicting Time-5 SDMT performances.

METHODS

- Participants** consisted of 177 healthy, noncase subjects enrolled in a longitudinal study of toxic exposure to estuarine *Pfiesteria*. Each subject (mean baseline age 44.2 ± 11.5 SD; mean education 12.6 ± 2.6 SD; males 80.2%) was administered the SDMT as part of a larger battery five times 5 to 6 months apart during approximately the first 2 years of the study (mean interval 22.3 months ± 3.1 SD).

RESULTS

Three sets of data analyses were conducted:

- Oneway repeated measures ANOVA of the SDMT scores revealed a significant linear practice effect, ($p < .000$); the mean SDMT scores are depicted in Figure 1.
- Separate SRB regression equations were calculated for each retest, with age, education, sex, test-retest interval, and previous SDMT scores entered as potential predictors. These equations are summarized in Table 1, and yielded highly significant multiple *R*s of .861, .868, .921, and .884, respectively. Figure 2 depicts Observed versus SRB Predicted SDMT Time-5 scores with a 90% confidence interval ($SE_{reg} = 5.045$).
- To assess the reliability of the subjects' scores on an entirely ipsative basis, a slope and Y-intercept across the first four SDMT scores for each subject was calculated and used to predict the subject's 5th SDMT score. The correlation between the observed and ipsatively predicted scores was $r = .824$ ($p < .000$) with an average unbiased SE_{reg} for four trials of 3.924, comparing favorably with the group SRB multiple *R* of .884 and SE_{reg} of 5.045.

FIGURE 1

Figure 1. Symbol Digit Modality Test Raw Scores At Each Test Interval

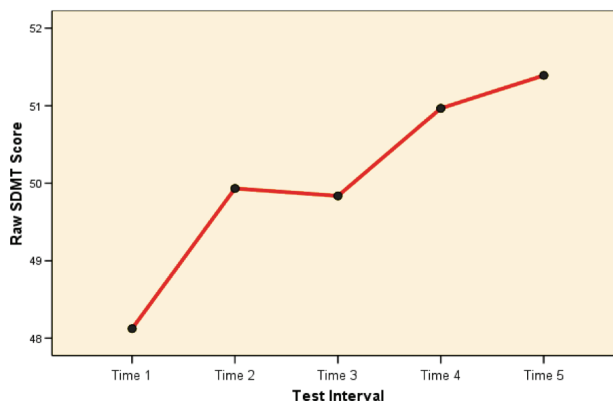


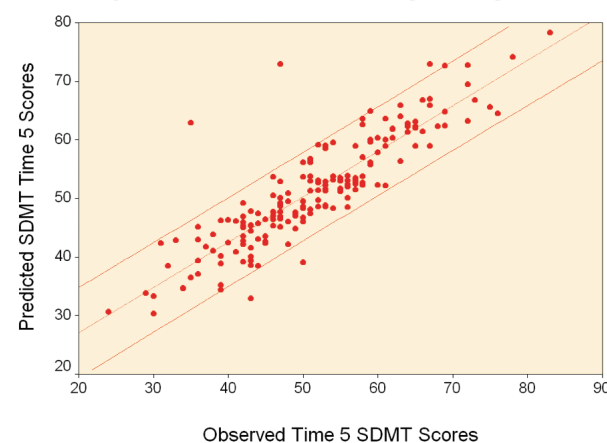
TABLE 1

Regression Equations for Predicting Prospective SDMT Scores

Criterion	R	R ²	SE _{reg}	Predictor Variables				Age	Constant
				SDMT 1	SDMT 2	SDMT 3	SDMT 4		
SDMT 2	.861	.742	5.244	.875					7.817
SDMT 3	.868	.754	5.373	.400	.481			-.109	11.412
SDMT 4	.921	.849	4.142	.168	.472	.340			2.261
SDMT 5	.884	.782	5.045	.232	.214	-	.501	-	3.856

FIGURE 2

Observed vs. Predicted SDMT Scores



CONCLUSIONS

- Results indicate that SRB methods can be reliably extended to predict cognitive performance across multiple time points while controlling for practice effects and error on both a group basis and at a purely ipsative level.
- SRB methods can be used to characterize different longitudinal "trajectories" of change over time.

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