R03 AG 026543-01A1 - TIME SERIES MODELS OF INTRAINDIVIDUAL VARIBILITY

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Final Report

The purpose of this research was to explore alternative statistical methods for capturing sequential dependencies in behavioral data. There has been an increase in interest in properties of behavioral time series, particularly the presence of long range dependencies (LRD). Generally the detection of LRD is complicated by properties of behavioral time series, particularly nonstationarity of the empirical data. While statistical methods exist for the detection of LRD and these methods have been used in the literature, these models are likely to falsely detect LRD due to violations of nonstationarity.

Our research was aimed at exploring methods appropriate for nonstationarity in the behavioral data that could capture a range of sequential relationships. In the original proposal, we identified a class of semi-parametric ARFIMA models as a candidate class of models. The application of these models to behavioral data is novel because the sequences, while long for behavioral data, are short for common applications of these methods. Large scale Monte Carlo simulations identified one specific problem with these models. That is the attempt to identify deterministic trends in the behavioral data resulted in a biased estimate of the strength of long range dependencies. That is, while these models are an attempt to simultaneously model deterministic trends and long range dependencies, in practice, these models are relatively poor at separately estimating these two distinct forms of sequential relationships. This is particularly the case for sequences of the length that we typically have available in behavioral research. However, portions of these methods have been used in three submitted manuscripts.

However, the process of competitive model testing in the original program of research, we have developed models that are capable of predicting patterns of sequential relationships in behavioral data that arise from the specific sequences of stimuli that individuals see in these experiments. This research has been presented in several different forms (Hutcheon & Spieler, 2009a, b; 2010) and both theoretical and empirical oriented manuscripts are currently in preparation.

Statement on Exclusion of Children from Research

The focus on this research was on the patterns of intra-individual variation in adults. Children represent a separate population that is outside the scope of this research.

Publications

Revill, K. P., & Spieler, D. H., (2009). Competition during comprehension. *Manuscript submitted for publication*.

Spieler, D. H., & Peng, L. (2010). Modeling time series data with deterministic trends. *Manuscript submitted for publication*.

Courrieu, P., Brand-D'Abrescia, M., Peereman, R., Spieler, D. H., & Rey, A. (2010) Validated intraclass correlation statistics to test item performance models. *Manuscript submitted for publication*.