The Application of Cognitive Neuroscience to Clinical Research II: Testing Cognitive Function via the Internet

Keith A. Wesnes, Ph.D.
Bracknell, Going-on-Thames, United Kingdom; Division of Psychology, Northumbria University, Newcastle, United Kingdom; Centre for Human Psychopharmacology, Swinburne University, Melbourne, Australia

BACKGROUND

The CDR System was developed which almost 1300 clinical trials in repeated use in clinical trials. It has been used in almost 1300 clinical trials. One trial conducted in 2004 tested 1,386 children long-term follow-up studies in childhood and the long duration trials which are now remote studies of nutritional products, and the application of such methodologies to web trials.

RESULTS

Internet Testing Shows Same Pattern as PC Testing

Internet and PC Testing

Means with 95% Confidence Intervals

Gender Differences: Male to Female Ratio 41:59

Means with 95% Confidence Intervals

DISCUSSION & CONCLUSIONS

This study demonstrates that remote cognitive testing is feasible in a wide range of existing clinical trial applications; while also offering the opportunity to conduct novel types of clinical trials. A few examples of existing trials which would benefit from such a methodology include: post-marketing safety (or efficacy) evaluations of novel medicines, remote studies of nutritional products, long-term follow-up studies in childhood cancer survivor cohorts, and the long duration trials which are now starting in the new indication of preclinical Alzheimer’s disease.

A novel trial opportunity could be the application of such methodologies to web-based patient interest groups, where previously untapped therapies, perhaps developed or discovered by members, could be evaluated by the groups for potential efficacy.

CDR Picture Recognition Task & Neurogenesis

Object Pattern Separation Tasks, the Dentate Gyrus and Hippocampal Neurogenesis

A Hippocampal Neurogenesis is the dentate gyrus (DG) a major target for compounds to treat memory disorders in a variety of clinical conditions including pathological aging.

The field became of interest to human cognitive neuroscience and the MRI work to demonstrated that DG activity increased when volunteers performed a task involving difficult object pattern separations, but not with simpler pattern separations.

Object pattern separation (OPS) tests can therefore reflect the quality of DG activity, and by implication provide an index of neurogenesis in man.

The CDR System picture recognition task is an OPS and data from normal ageing show the utility of this task to reflect DG activity and thus hippocampal neurogenesis.

Declines in a Measure Reflecting Hippocampal Neurogenesis

(red bars) Accuracy & speed scores expressed as declines from 18-25 years

Means with 95% Confidence Intervals

REFERENCE

Poster presentation at the 53rd Annual Meeting of the New Clinical Drug Development Unit (NCDEU), May 28-31, 2013, Hollywood, FL USA

COMMENTS

The findings confirmed a previously conducted laboratory trial.

METHODS

The website offered feedback on cognitive function.

Five language versions could be selected:

- English, Greek, Hungarian, Portuguese & Spanish

Individuals clicked on the link entered their age and gender, and could perform 4 tests from the CDR System lasting 10 minutes:

- Attention, Concentration, Vigilance
  - Simple Reaction Time (SRT) - 2 mins
  - Digit Vigilance Task (DVT) - 3 mins
  - Choice Reaction Time (CRT) - 2 mins

- Episodic/declarative Memory
  - Picture Recognition - 2.5 mins

Pattern Over Individual Task Measures

- Power of Attention
  - A measure of focussed attention and information processing

- Continuity of Attention
  - A measure of sustained attention

- Cognitive Reaction Time
  - The difference between choice and simple reaction time assessing central processing speed independently of motor speed

- Fluctuations in Attention
  - The summed variability of the reaction times in the 3 tasks, reflecting momentary lapses in attention

- Ability to correctly recognise original pictures

- Tests show clear and marked changes with ageing

- Declines from 21 to 77 years can be seen year by year

- Gender differences also consistent with laboratory testing

- Picture recognition task has a measure which is specific to dentate gyrus activity which will help identify and evaluate the efficacy of compounds designed to promote neurogenesis

- This study demonstrates that remote cognitive testing is feasible in a wide range of existing clinical trial applications; while also offering the opportunity to conduct novel types of clinical trials.

- A few examples of existing trials which would benefit from such a methodology include: post-marketing safety (or efficacy) evaluations of novel medicines, remote studies of nutritional products, long-term follow-up studies in childhood cancer survivor cohorts, and the long duration trials which are now starting in the new indication of preclinical Alzheimer’s disease.

- A novel trial opportunity could be the application of such methodologies to web-based patient interest groups, where previously untapped therapies, perhaps developed or discovered by members, could be evaluated by the groups for potential efficacy.