Christchurch Medical Research Society

Scientific Meeting

Friday 1 November 2002
12:00 – 1:30 pm in the Rolleston Lecture Theatre

12:00 LUNCH IN THE GROUND FLOOR FOYER

12:30 ORAL PRESENTATIONS

12:30 **Recovery of oculomotor, visuomotor and neuropsychological deficits following mild closed head injury**
Marcus H. Heitger*, Timothy J. Anderson, Richard D. Jones, Michael Ardagh

12:45 **Trinucleotide expansion in the human androgen receptor gene is not associated with poor semen quality in men**
Tanya Erasmuson*, Iris. L. Sin, Frank Y. T. Sin

1:00 **Using signal decomposition and dipole modelling to detect focal activity in the EEG**
Bart Vanrumste*, Richard D. Jones, Philip J. Bones, Grant J. Carroll

1:15 **Social class and the determinants of smoking among young people: an analysis of causal pathways using data from the Christchurch Health and Development Study**
Gabrielle Jenkin*

* Contestants for the CMRS Young Researcher Prize

Recovery of oculomotor, visuomotor and neuropsychological deficits following mild closed head injury

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We have earlier found that motor deficits and neuropsychological impairment immediately following mild closed head injury (CHI) are largely independent phenomena. In this study, we compared 37 patients with mainly mild closed head injury (36 mild and 1 moderate) and 37 controls (matched for age, gender, years of education) at 1 week, 3 months and 6 months post injury on measures of oculomotor function (saccades, smooth pursuit), upper-limb visuomotor function (visual perception, basic arm motor function, eye-arm tracking tasks), neuropsychological performance (Paced Auditory Serial Addition, PASAT; California Verbal Learning, CVLT; Symbol Digit Modalities, SDMT; Trail Making A+B, Wechsler Abbreviated Scale of Intelligence, WASI), and several outcome measures (SF-36 health survey, 'Rivermead Postconcussion Symptoms' and 'Rivermead Head Injury Follow-up' questionnaires).

At 1 week, the CHI group reported high rates of postconcussion symptoms and demonstrated prolonged saccade latencies, increased directional errors and decreased saccade accuracy in combination with increased arm movement reaction time, decreased arm movement speed, and decreased motor accuracy on the tracking tests. Fast oculomotor smooth pursuit was mildly impaired. SF-36 was impaired on all 8 scales while neuropsychological testing only showed deficits on the CVLT and SDMT.

At 3 months, several oculomotor and visuomotor deficits remained in combination with some deficits on the CVLT, despite decreased rates of postconcussion symptoms and normalisation of the SF-36 scores. At 6 months, the CHI group showed no deficits on our tests while still reporting abnormal levels of postconcussion symptoms.

These results indicate that multiple motor systems can be impaired following mild CHI and that this can occur in the absence of widespread neuropsychological impairments. Our study also indicates that quantitative tests of oculomotor and upper-limb visuomotor function can provide sensitive markers of cerebral dysfunction and supports the possible use of such tests to supplement patient assessment.

Trinucleotide expansion in the human androgen receptor gene is not associated with poor semen quality in men

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Spermatogenesis is thought to be regulated by numerous genes including those on the Y-chromosome and the androgen receptor on the X-chromosome.

Previous studies have shown that CAG repeat expansion is associated with infertility. Further, there is accumulating evidence for the involvement of Y-chromosome-linked genes, such as AZF. However, there have been no concurrent studies investigating mutations in these genes.

We aimed to investigate the possible relationship between semen quality and AR-CAG repeat number and microdeletions of the AZFc region in a New Zealand Caucasian sample population. A total of 105 subfertile men and 93 fertile men were analysed by PCR and sequenced to determine CAG repeat number. The majority of samples were analysed for microdeletions using two multiplex PCR reactions and confirmed using Southern blotting. Mean CAG repeat number for each group of men was compared using two-sample one- and two-tailed t-tests and considered significant if $p<0.05$. Subfertile men did not have significantly different AR-CAG repeat numbers to fertile men (21.46 ± 0.30 vs 20.99 ± 0.28, $p = 0.126$), arguing against the hypothesis that higher CAG repeats are associated with male infertility. Y-chromosome microdeletions were detected in 7.4% of subfertile men and not fertile men. There was no correlation between the presence of a microdeletion in AZFc and CAG repeat number.

Comparison with other studies of Caucasian men suggested that different populations might show variation in repeat number in addition to the previously noted racial variation. The number of microdeletions in the AZFc region is consistent with previous studies.

Using signal decomposition and dipole modelling to detect focal activity in the EEG

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Detection of focal EEG activity is important in the diagnosis of epilepsy. We have developed an algorithm for the detection of focal activity in multi-channel EEG recordings. The EEG is divided into overlapping epochs, which are processed in two steps. The first is singular value decomposition (SVD) which gives the most dominant potential distribution with respect to energy. When the fraction of the energy in the epoch associated with this distribution is high, we can assume this has arisen from a single primary active source in the brain. In the second step, EEG dipole source analysis (assuming a single dipole and 3-layer spherical model of the head) is applied to that dominant potential distribution. This aims to find the focal neural sources represented by a dipole which generate scalp potentials corresponding as closely as possible to the given potentials. This is accomplished by changing the dipole parameters until a minimum is found in the cost-function given by the relative residual energy (RRE). The smaller the RRE the better the dominant potentials obtained from the SVD represent a focal source. It was found that dipoles located on the inner-shell representing the brain-skull boundary are typically attributed to EEG artifacts. The detection algorithm flags an EEG epoch when SVD indicates a dominant source, the RRE is low and the dipole is not located too close to the inner-shell. The algorithm has been applied to real EEG containing multiple spikes and artifacts (eye-blinks, electrode artifacts). The SVD indicated a dominant source active for both spikes and artifacts and no dominant activity for background EEG. The RRE was also low for both types of events. These preliminary results indicate that the method can be used to detect seizures and spikes with a focal origin. In addition the dipole parameters can provide valuable information on the location of the epileptogenic source.

Social class and the determinants of smoking among young people: an analysis of causal pathways using data from the Christchurch Health and Development Study

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This study examined whether the social class gradient in parental smoking – of increasing rates of smoking with decreasing social class - was replicated amongst their children at age 21, and examined causal mechanisms accounting for this phenomenon. Drawing on data collected by the Christchurch Health and Development Study (CHDS) – a longitudinal study of a birth cohort of 1265 children born in Christchurch during 1977, this research tested a hypothetical model of potential pathways between parental social class and their offspring smoking.

Initial analyses revealed the presence of a statistically significant ($p = 0.0002$) social class gradient in smoking amongst the CHDS cohort. A series of linear logistic regression analyses revealed that of six potential pathways identified from the literature: parental smoking, parental attitudes to smoking, early smoking experimentation, deviant behaviour, educational achievement, and affiliations with smoking peers, only four were found to mediate the association between parental social class and offspring smoking ($p= 0.05$). These were: parental smoking, deviant behaviour, educational achievement, and affiliations with smoking peers. A log-linear model fitted to the data revealed that the association between parental SES and young adult smoking was explained by three pathways: directly by way of parental smoking and educational achievement, and indirectly via the effect of parental smoking on affiliations with smoking peers.

This analysis of the CHDS data highlighted how parental smoking and educational achievement, and to a lesser extent, affiliations with smoking peers, are potential points for intervention in reducing the socioeconomic gradient in young adult smoking.