Brain Sciences UNSW

2010-2011

This Issue:

Clinical Neuropsychology

Dear Reader.

This is our annual newsletter in which we detail our research activities over the past 12 months. This includes completed projects and also projects that are currently still underway. It is my pleasure to provide you with an overview of what has been happening- the kind of research we do, the people involved, the projects we have conducted and who has assisted us, all detailed below,

Best wishes

Professor Skye McDonald

Clinical Groups

The research that our team conducts is essentially concerned with disorders that arise from brain dysfunction due to structural or developmental conditions. We are interested in disorders that arise from a variety of different kinds of brain impairment including acquired brain impairment such as arising from trauma, degenerative conditions and mild cognitive impairment. We are also interested in developmental conditions such as Parkinson's disease, Asperger's syndrome and psychiatric conditions.

Type of Research

"By measuring psychophysiological events we have a clearer understanding of how people respond emotionally to significant events."

Our research has a number of streams looking at (1) communication disorders (2) emotional disorders and (3) remediation. In each case we are interested in how these disorders impact upon everyday functioning. We have a particular interest in psychophysiology. Psychophysiological techniques allow us to measure bodily reactions to external events (like changes in heart rate and skin temperature). By measuring these we have a clearer understanding of how people respond emotionally to significant events.

Research Team

Our dedicated research team is lead by myself with the able assistance of Dr Jacqueline Rushby (NHMRC Clinical Research Fellow) who has great expertise in psychophysiological techniques and is a sought after mentor for everyone in the lab. We have three wonderful full-time research assistants: Nicole Pesa, Matt Davidson and Thea Longman and two equally fabulous part-time assistants: Therese English and Jamie Iredale. Therese worked with us fulltime last year but has now commenced a combined PhD/Masters clinical program. We were very sad to lose Ali Gowland at the end of last year as she decided to return to the UK to do medicine (where she was courted by the top medical schools in the land). Our RAs are available to take any calls or queries about the research program (93853524).

Emilie Andersson having fun in the lab

Clinical Neuropsychology

Students

There are currently 7 PhD students in the team: Arielle Taylor (about to complete), Michelle Kelly, Danielle Mathersul, Maurice Finn, Hannah Rosenberg. Emily Trimmer has recently joined us after working as a clinical psychologist. We also have Marie Dethier, a student from Belgium who has joined us for the year. We also have several honours students: Jenny Li, Matt Gerathy and Emilie Andersson – who is visiting from Sweden. So it is a busy lab.

This Newsletter

Marie Dethier and Jenny Li at Journal Club

The aim of this newsletter is to inform you of how your involvement is contributing to our understanding of how the brain processes social and emotional information both before and after a brain injury as well as what treatment techniques we are trialling. This newsletter presents 14 different studies. Each study is described in terms of what it was about, what we did, and what we found. Where studies have been submitted for publication, the reference to the article has been provided in case you want to read more about the study. In most cases it takes a long time for articles to be published, so most articles are not immediately available but will be in the next year or so. We have also detailed articles and conference presentations that are accepted for publication.

Acknowledgements

Many people and agencies have been involved in coordinating and assisting in these research studies. We would especially like to acknowledge the outstanding brain injury rehabilitation teams at Ryde Royal Rehabilitation Centre, Liverpool Hospital and Westmead Hospital.

Several of these projects also represent collaborations with researchers at UNSW and other institutions, in particular, Robyn Tate at the Rehabilitation Studies Unit, University of Sydney, Leanne Togher at the Faculty of Health Sciences, Uni of Sydney, Shane Darke at the National Drug and Alcohol Research Centre, Melissa Green at the Black Dog Institute, Sydney and Marc Pell, McGill University, Montreal.

Finally, as always we must express our deepest appreciation to all the people with a brain injury and their families, as well as our control participants, who have happily given their time and energy to contribute to our research. Without your willing participation none of this research would have been possible.

1. Facial Mimicry of 'Unseen' Emotional Expressions

Jacqueline Rushby, Skye McDonald, Ali Gowland, Therese English, Thea Longman & Nicole Pesa.

What the study is about:

One of our research studies last year examined facial mimicry in adults with traumatic brain injury. That study found that healthy adults mimicked both happy and angry facial expressions, but adults with a traumatic brain injury only mimicked happy facial expressions.

This is a follow-up study to explore what happens to these facial mimicry effects when the viewer is not consciously aware that they are seeing a facial expression. Previous research has shown that people still display facial mimicry even when they're shown a facial expression for such a short amount of time that they're not consciously aware of what they have seen. We wanted to examine whether people who have had a brain injury mimic emotional facial expressions under these "sub-conscious" conditions.

What we are doing:

 In this study, people with and without a traumatic brain injury viewed happy and angry faces, using a technique that prevents people from being consciously aware that they're viewing these faces. We monitored facial muscle activity, heart rate (HR) and skin conductance (SCR) during the task

What we have found so far:

When the control group was not consciously aware that they were viewing emotional facial expressions, they showed an increase in their skin response when viewing angry compared with happy faces. Responses in the TBI participants were lower than controls; however within the TBI group, the reverse relationship was found - i.e. higher skin responses for happy compared with angry faces (Figure 1, upper panel). When both groups were aware they were viewing emotional expressions, the same relationships were found to the angry faces, however, skin responses in TBI participants were much larger than controls for happy faces (Figure 1, bottom panel). The results indicate that controls and people with TBI have different physiological responses to emotional expressions even when they are not aware that they are viewing them. We are currently looking at heart rate and facial muscle activity, and are still looking for participants with and without a brain injury to help us with this study – we would love to hear from you!
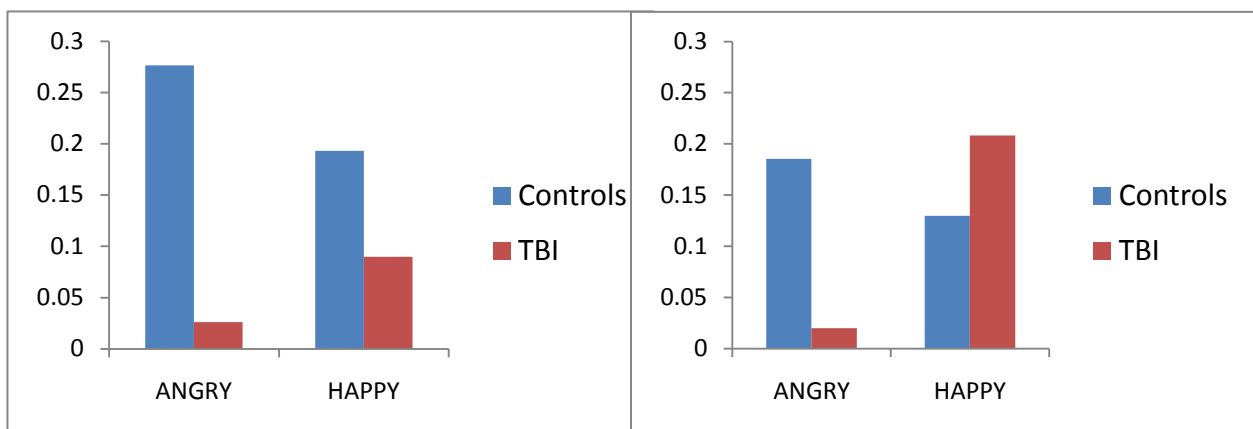

Figure 1: Skin conductance response when unconsciously (above) and consciously (below) viewing happy and angry facial expressions for control participants and people with TBI.

2. **Does Mood Effect Communication Style Following Severe TBI?**

Nick Lim Howe, Skye McDonald, Therese English, Ali Gowland.

What the study is about:

Many people with TBI have problems communicating effectively. Specifically they can often come across as insensitive or inappropriate, with poor diplomatic skills. This may be a result of poor executive control of language, but it is also possible that poor emotion regulation plays a role, such that they have difficulty regulating emotional reactions to situations and this flows on to the difficulty regulating what they say when emotionally aroused. This study manipulated emotional mood to see if this affected language use. The role of deficits in executive control, drive and processing speed were also examined.

What we did:

A group of 15 people with severe TBI and a group of 15 people from similar backgrounds but without an injury took part in this study. Firstly they were shown negative or positive movies to influence their mood. Then they were asked to make requests or hints to other people. They were also tested on neuropsychological measures of control, drive (initiative) and processing speed. Their relatives also filled in a questionnaire as to how impaired they were in drive and control (the CBS).

What we found:

The TBI group were impaired relative to the non-injured group on neuropsychological measures of control, drive and speed. All participants reported feeling more positive after watching funny movies and less positive after watching sad movies. Those people with TBI who were rated by their relatives as having less control tended to show greater mood swings after watching the funny films.

All participants, both those with TBI and those without, tended to be rated as less polite, i.e. more direct when they were in a positive mood. (This is consistent with expectations that people use more formal, distant kinds of language when they feel distant from others, or less powerful in relation to others, both of which occur when people are in a negative mood state). There was a suggestion this was exaggerated for those with TBI. Surprisingly, both groups were also rated as being less "friendly" when they were in a positive mood and again, this appeared to be exaggerated for those with TBI (see Figure 2).

Finally, we found that those people with TBI who had slowed information processing speed were more likely to produce speech acts that were rated as both impolite (direct) and unfriendly. We did not find any relation between neuropsychological measures of drive and control, and performance on these communication tasks.
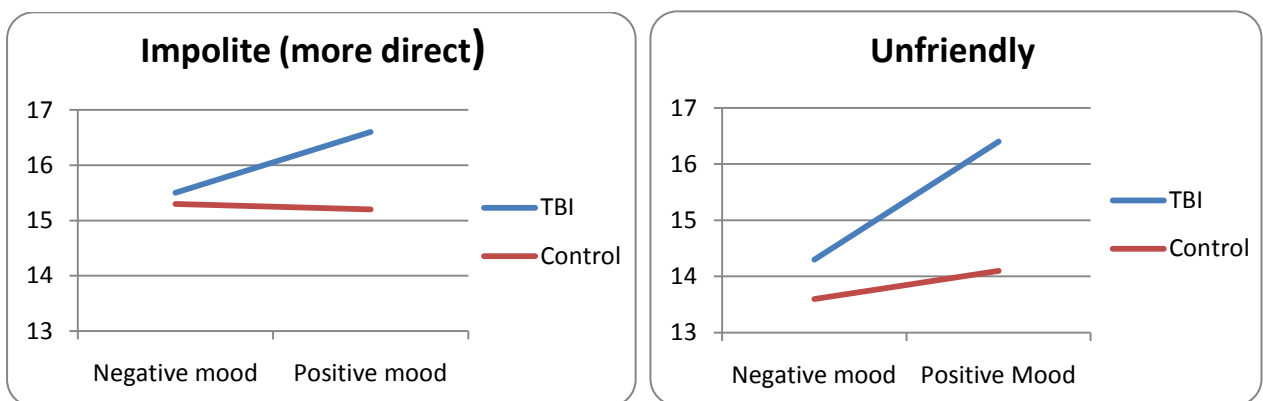

Figure 2: Ratings of participants' Impolite and Unfriendly language use after inducing positive and negative mood-states.

3. Improving Tests of Social Perception: TASIT Revised.

What the study is about:

The Awareness of Social Inference Test (TASIT) was developed by Skye McDonald, Sharon Flanagan and Jennifer Rollins and published in 2001 by Thames Valley Test Company (now Pearson Assessment). It uses video vignettes of actors engaged in everyday social encounters and viewers are asked to watch the vignettes and answer questions. Their understanding of what the speakers are feeling, thinking and saying in the vignettes is then assessed.

TASIT is extremely sensitive to problems in social perception after acquired brain injury. It is also sensitive to these kinds of problems in people with schizophrenia, with right hemisphere damage, with fronto-temporal dementia, and to a lesser extent, people with Alzheimers Disease.

TASIT was designed to assess adults and there are no equivalent tests for assessing adolescents and children. Consequently, we took TASIT to a variety of schools in NSW to see whether adolescents were able to answer the questions accurately. In order to establish normative data on TASIT for adolescents aged 13–15 years, 448 school children were recruited. Recruitment occurred between 2003 and 2010 with the cooperation of five secondary schools in Sydney, Australia; three private Catholic schools in outer Sydney (St Mary's Star of the Sea,

Wollongong, Patrician Brothers College, Blacktown and Delany College, Granville n = 295) and two government schools ((Canterbury Boys High School, Leichhardt High School: n = 153) from inner Sydney.

What we found:

321 students aged 13-15 who spoke English at home, including those who spoke more than one language at home were used to create norms for Parts 1–3. Overall girls out performed boys. 15 year old adolescents are able to answer the questions in TASIT much the same as do adults, although not quite as well. The older students did better on Part 2 of TASIT but there was no correlation between age and either Part 1 (emotion recognition) or Part 3 (lies and sarcasm with extra context). In general, the adolescents did perform more poorly than adults, although the size of the difference was not great. Adolescents from non-english speaking backgrounds found TASIT a little more difficult than native English speakers. This is extremely useful to know because it suggests that TASIT may be useful to use with adolescents with traumatic brain injury, provided we compare them to other adolescents, not simply adults' performance.

4. Emotion Recognition Deficits in Adults with Traumatic Brain Injury (TBI) and Parkinson's Disease (PD)

Hannah Rosenberg, Skye McDonald.

What the study is about:

People suffering from a range of psychiatric and neurological disorders often experience difficulties interpreting social situations and understanding the emotions portrayed by others. The ability to accurately recognise how other people are feeling is very important in a variety of everyday social situations. Two conditions where emotion recognition deficits are often reported are traumatic brain injury (TBI) and Parkinson's disease.

There are several issues arising from research into emotion recognition that guide this study. First is the notion that there is a vast array of human emotions, examples of which include guilt, pride, compassion, and jealousy. However, despite the large range of emotions that we may experience, research to date has mostly focused on our recognition of just six emotions (termed 'basic emotion'), namely happiness, surprise, sadness, anger, fear and disgust.

Second is the issue of differential difficulty in recognition of the various emotions. Research suggests that while some emotions (such as happiness) are easier to recognise, others (such as fear) are more difficult. This means, for example, that it is generally easier to recognise when someone is happy than when that person is scared.

This study has two aims. First, we aim to examine the differential difficulty of the 'basic' six emotions by using a measure that maps subtle changes in emotion intensity in the face. Second, we aim to develop a new measure to examine the recognition of a wider array of emotions than the conventional six. Some examples of these 'complex' emotions include contempt, amusement, pride, and guilt. This measure will consist of video vignettes in which the observer will be asked to judge what emotion is experienced by the person in the scene. Following the development of the new emotion recognition measure, it will be pilot-tested on healthy university students (to generate norms) and then applied to people with TBI and Parkinson's disease. This will allow the examination of the subtle emotion recognition deficits in these two conditions, which the conventional measures have so far failed to reveal.

What we are doing:

The research is being conducted as part of a Ph.D in the School of Psychology at the University of New South Wales. This is a new project with data collection having started earlier this year. Participants with a brain injury as well as control participants were asked to view a series of faces on a computer screen and select what emotion best described how the person in the picture was feeling, as well as to undergo conventional neuropsychological tests. Data collection with Parkinson's disease participants is scheduled to start later this year. The new complex emotion recognition measure is currently in development and testing is scheduled for the end of the year.

Volunteers welcome:

We're still looking for **people with a brain injury,** Parkinson's disease, and control participants (that do not have a brain injury or Parkinson's disease) to participate in our research. Please contact us on 9385 3524 if you are interested to take part in our research.

To find out more about this study:

Contact Hannah Rosenberg:
hannah.rosenberg@unsw.edu.au

PhD candidate Hannah Rosenberg

Clinical Neuropsychology

5. Why Don't You Feel How I feel? Insight into the absence of empathy after severe TBI.

Arielle de Sousa.

What the study is about

Empathy is a critical component necessary for the development and maintenance of successful interpersonal relationships. Given that severe Traumatic Brain Injury (TBI) is known to produce marked changes to social functioning, and although the existence of empathy deficits in people with TBI is generally well accepted, it is surprising that few studies have directly examined empathy in this population. The present research attempted to close this gap in the literature by providing an investigation into the deficits in both emotional and cognitive empathic abilities following severe TBI using psychophysiological indices of emotional responding, including facial electromyography (EMG) and skin conductance.

What we did:

The study examined the relationship between self-reported emotional and cognitive empathy and psychophysiological responding to emotionally evocative pictures in 20 patients with severe TBI and 22 control participants. Eighteen pictures with alternating pleasant, unpleasant and neutral content selected from the International Affective Picture System (IAPS) were presented whilst facial muscle responses, skin conductance, and valence and arousal ratings were measured. Self-reported emotional and cognitive empathy questionnaires were also administered.

What we found:

In comparison to control participants, those in the TBI group displayed a reduction in the ability to empathize both emotionally and cognitively, and evidence that these two aspects of empathy may be interconnected was established.

Further, as can be seen from these figures, TBI participants showed reduced facial responding as evidenced by reduced brow (Corrugator) activity to unpleasant pictures specifically. They also rated these images as less unpleasant and arousing than controls. In addition, they exhibited lowered autonomic arousal to all pictures, regardless of affective valence. Interestingly, hypoarousal to pleasant pictures in particular was found to be related to the absence of empathy observed after TBI, and is consistent with the view that impaired emotional responsivity is associated with impairment to the empathy network.

The results have important implications for understanding the impaired social functioning and poor quality of interpersonal relationships commonly seen as a consequence of TBI, and may be key to comprehending and treating empathy deficits post-injury. Indeed, the hope is that understanding empathy at a behavioural level will assist in the development of treatments to improve empathy impairment after brain injury.

This is especially pertinent given the highly increasing incidence of TBIs, and the potential negative ramifications of empathy deficits to social functioning and quality of life in this population.

While results that highlight the importance of emotional responsivity in empathy following TBI are very exciting, it remains crucial to continue exploring the mechanisms underlying empathy.

Read more about this study:

de Sousa, A., McDonald, S., Rushby, J., Li, S., Dimoska, A., & James, C. (2010). Why don't you feel how I feel? Insight into the absence of empathy after severe Traumatic Brain Injury. Neuropsychologia, *48*, 3585-3595.
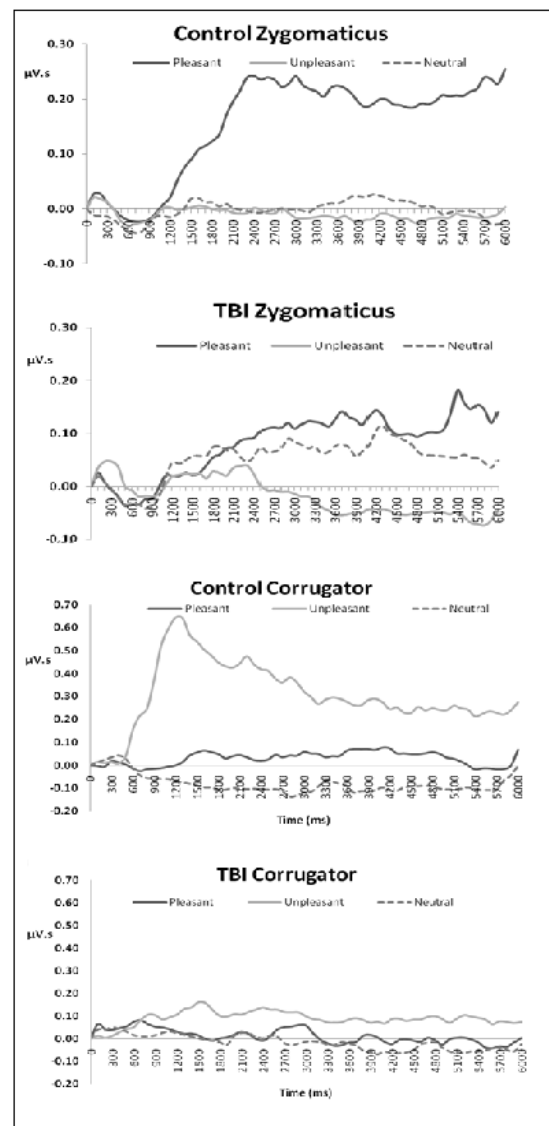
6. Changes in Emotional Empathy, Affective Responsivity and Behaviour Following Severe TBI.

Arielle de Sousa.

What the study was about:

People with severe traumatic brain injury (TBI) are known to exhibit marked difficulties in the domains of empathy, emotional responsivity, and social behaviour. But are these problems related? The current study addressed this question and provided an extension of the previous study by examining whether the specific disorders in emotion regulation manifest in maladaptive behavioural patterns (i.e. loss of emotional control and/or drive) contribute to changes in emotional empathy and responsivity post injury.

What we did:

Film clips containing pleasant, unpleasant and neutral content were presented to a sample of 21 adults with severe TBI and 25 control participants whilst facial muscle responses, skin conductance, and valence and arousal ratings were measured. Self-reported emotional empathy questionnaires were also administered in addition to a range of neuropsychological tests. A close relative of each TBI participant completed the Current Behaviour Scale (CBS) to assess for changes in emotional control and drive occurring as a consequence of the injury.

What we found:

In comparison to control participants, those in the TBI group displayed a reduction in the ability to empathize emotionally and an impaired pattern of facial responding to both pleasant and unpleasant films. They also exhibited lowered autonomic arousal, as well as abnormal ratings of valence and arousal, particularly to unpleasant films. Interestingly, relative reported loss of drive was significantly related to poor empathy, whereas by contrast, relative reported loss of emotional control was associated with heightened empathy levels in this population. The results represent the first to suggest that level of emotional empathy post injury is associated with disorders of drive or control. On the basis of the present findings, social skills difficulties appear to be linked to the poor emotional empathy noted post-injury, although the direction of this relationship, i.e. whether impaired emotion regulation leads to reduced empathy or visa-versa, that decreased empathy produces poor social skills, is unclear.

Read more about this study:

de Sousa, A., McDonald, S., & Rushby, J. Changes in emotional empathy, affective responsivity and behaviour following severe traumatic brain injury. (Submitted).

7. Cognitive Impairment in Methadone Patients.

Shane Darke, Skye McDonald, Sharlene Kaye & National Drug and Alchohol Research Centre.

What this study is about:

Previous research has suggested that chronic heroin use is associated with poor cognitive function, although the reasons are unclear. People who use heroin face a number of risks that might expose them to acquired brain injury, including overdose induced hypoxia, traumatic head injuries through the violence of the drug sub-culture, and the sequelae of heavy alcohol intake. In this study we aimed to examine cognitive function in those who were on a methadone maintenance program, compared to a group who were on an abstinence program and a comparison group of people who had never used heroin.

What we did.

125 opioid maintenance (OM) patients, a comparison group of 50 patients who were enrolled in an opioid abstinence (OA) program for treating heroin problem dependence, and a further comparison group of 50 healthy subjects with no history of opioid use or dependence (NHU) were tested on a battery of neuropsychological tests to assess (1) premorbid intelligence (2) attention and working memory (3) processing speed (4) new learning (5) executive function.

What we found

The 2 opioid user groups were older, less educated, more depressed and had lower premorbid IQ than the non-heroin using group. Controlling for these influences, it was found that the OM group had poorer global cognitive function and specifically poorer executive function and learning than both the OA and the NHU groups. The OA group did not differ from the control group on these measures. The OM and OA groups had more significant head injuries than the NHU group. But even controlling for this the OM participants were worse than the others. So while head injury may have had some affect, this did not account for the findings. Nor did the number of heroin overdoses or extent of significant problem drinking histories account for cognitive impairment. This raises the question as to whether the OM group were self-selected, i.e. those with poorer cognitive function (for whatever reason) were more likely to choose an opioid maintenance program rather than the more demanding residential rehabilitation.

These findings have important implications for those who run maintenance clinics as they suggest that many clients have significant cognitive deficits that will impact upon their ability to learn and comply with program regulations.

8. The Role of Emotion Processing In Social Decision-Making.

Michelle Kelly, Skye McDonald, Jacqueline Rushby, David Kellett.

What the study was about:

People with a traumatic brain injury often have problems making decisions in everyday life. It is possible that the difficulties experienced when making decisions about everyday things, like what to eat and what to wear are very different to difficulties experienced when making decisions about things that affect us emotionally or socially. Decisions that involve our emotions include whether to start or end a relationship, whether to confront a friend about a disagreement or whether to spend all your savings. It is also possible that different areas of the brain are responsible for these two types of decisions and thus damage to one area may only affect one type of decision-making. The current project aims to develop a test that will investigate decision-making in a social situation where our emotions are involved. By developing a test that is able to detect decision-making difficulties in social situations, we may be able to determine what makes these two types of decisions different and whether the addition of a social context makes decisions easier or harder for people with a brain injury.

What we did

Participants were asked to complete a number of different tasks. The card game asked participants to choose cards from 4 decks. With each card choice, the participant would win some money, but could also lose some. By looking at the choices made we can see if participants were able to learn which decks would win them the most money in the end (everyday decision-making). The new task that was developed to test decision making in a social situation asked participants to play a game of 'catch and throw' with other participants on the internet. Participants were asked to try to 'win' as many throws as they could.

Also, sometimes we feel as though we are not having an emotional response to a situation yet our body says differently. Using small electrodes attached to the fingertips, we are able to measure very small changes in heart rate and perspiration that represent emotional responses. This may tell us whether an injury to certain parts of the brain may stop people being aware of the changes that are happening in their body when they are making emotionally charged decisions.

What we found:

We have tested 26 participants with a brain injury on two occasions and 15 participants without a brain injury. At this stage, we have only looked at the data for the new task. The results suggest that as a group, the brain-injured participants were less able to determine which players would return the ball the most, and therefore ended up winning less throws overall. Given that the social game is a new task, we need to do a lot more testing with it before we can be sure what this means. The next study, which started in March, is looking at the consequences of poor decision-making in social contexts.

We would like to say a big thank you to all the lovely people in Newcastle who have kindly volunteered for our research so far. This important work would not be possible without you.

To find out more about this study:

Contact Michelle Kelly: mkelly@psy.unsw.edu.au

PhD candidate Michelle Kelly

9. Communication Training for people with severe TBIs and their families

Leanne Togher, Skye McDonald, Robyn Tate (USyd).

What this study was about

This clinical trial evaluated treatments to improve communication skills and interpersonal relationships following severe TBI. The study determined the most effective approach: (1) treating communication deficits of the person with TBI directly (TBI SOLO) or (2) training both the person with TBI and their everyday communication partner (JOINT) to enable successful interactions with the TBI person to occur.

What we did

The efficacy of the two approaches were evaluated relative to a (3) delayed therapy control group (CTRL) in terms of improving the degree and quality of participation in conversation exhibited by people with TBI. Treatment manuals were constructed in 2007 and refined over 2008-9. Three waves of data collection were completed in 2007-2009. Each wave was conducted at one of the TBI rehabilitation centres in Sydney and included, screening, pre-training assessments, a 10 week training program for two groups, post-training assessments and a 6 month follow-up assessment. A total of 44 participants were recruited with a retention rate of 93.18% at post assessment.

During 2009 - 2010, video conversational data was rated by 2 blind raters, all conversational video data have been transcribed and assessment scores entered into the study database.

What we found

Ratings from 2 blind raters on the degree of appropriateness, effort, engagement, reward and task completion indicated that the JOINT group were significantly improved compared to the CTRL group but not significantly different from the TBISOLO group. We developed a treatment program "TBI Express" that is now available via ASSBI Resources http://www.assbi.com/assbiresources.html.

To read more about this study see;

1. Togher, L., McDonald, S., Tate, R., Power, E., & Rietdijk, R. (2009). Training communication partners of people with TBI: Reporting the protocol for a clinical trial. *Brain Impairment,* 10(2), 188-204.

2. Togher, L., McDonald, S., Tate, R., Power, E. & Rietdijk, R. (2010). Measuring the social interactions of people with traumatic brain injury and their communication partners: the adapted Kagan scales, *Aphasiology, 24 (6), 914-927.*

3. Togher, L. McDonald, S., Tate, R., Power, E., Ylvisaker, M. & Rietdijk, R. (2011) TBI – Express: Social communication training for people with TBI and their communication partners, Sydney: ASSBI Resources

10. Social Cognition, Empathy, and Functional Outcome in People with Schizrenia

Amy Sparks, Skye McDonald, Bianca Lino, Maryanne O'Donnell, Melissa J. Green (Black Dog Institute)

What this study was about

Social functioning difficulties are considered to be a core characteristic of schizophrenia. Increasingly, it appears that these difficulties may relate to social cognition difficulties, i.e. problems perceiving the emotional states of others and also what is on their mind (mental state inferences). This study investigated whether deficits in social cognition predicted social functioning and empathy in schizophrenia.

What we did

Twenty-four outpatients with a diagnosis of schizophrenia or schizo-affective disorder, and 18 healthy controls were administered The Awareness of Social Inference Test (TASIT) a video measure of conversational interactions, and measures of self-reported empathy and social functioning.

What we found

Participants with schizophrenia performed more poorly than controls in identifying emotional states of others, and had difficulty understanding what the speakers intended when lying or being sarcastic, during videotaped social interactions. Poor comprehension of sarcasm was associated with high personal distress on the empathy measure, and low recreational functioning.

To read more about this study

Sparks, A., McDonald, S., Lino, B., O'Donnell, M., Green, M.J. (2010) Social cognition, empathy and functional outcome in schizophrenia. Schizophrenia Research, **122,** 172-178

11. Physiological Arousal Changes to Emotional Expressions

Jacqueline Rushby, Skye McDonald, Anne Murphy, Jaimi Iredale.

What this study was about:

Emotion regulation is crucial for normal social interaction and depends critically on an individual's ability to adjust physiological arousal on a moment-to-moment basis. While arousal is generally agreed to be a component of emotion, an accurate measure of physiological arousal produced by emotional stimuli is still a matter of wide debate. Previous research has consistently shown an inverse relationship between skin conductance level (SCL) and mean EEG alpha power during an eyes-closed (EC) and eyes-open (EO) resting conditions, supporting the utility of these measures as indices of arousal, but whether a relationship exists between measures during emotive conditions is unknown. For the current study, these arousal indices were examined while participants observed positive (happy) and negative (angry) valanced emotional facial expressions.

What we did:

Thirty right-handed female undergraduate students participated in five 2 minute conditions (EC, EO, view neutral face, view happy face, view angry face). The same female face with each expression was presented. Presentation order for happy and angry expression was counterbalanced. Participant's level of empathy was also measured using the Balanced Emotional Empathy Scale (Mehrabian, 2000).

What we found:

As expected, SCL was negatively correlated with alpha power, for the EC condition, and a significant increase in SCL, and reduction in alpha power, was observed from EC to EO. As can be seen in the figure an increase in arousal was reflected by increased SCL and reduced alpha power for the emotional conditions compared to a baseline eyes-closed condition.

No differences were found in either SCL or alpha power for valence (angry vs. happy). These findings provide further support for the utility of using SCL and alpha power as reliable indices of arousal. Participants with higher levels of empathy were associated with higher levels of arousal to the positively-valenced (happy) face. This suggests some link between empathy and a heightened responsivity to pleasant emotional facial expressions. This year we will commence examination of these arousal indices in a group of TBI participants.

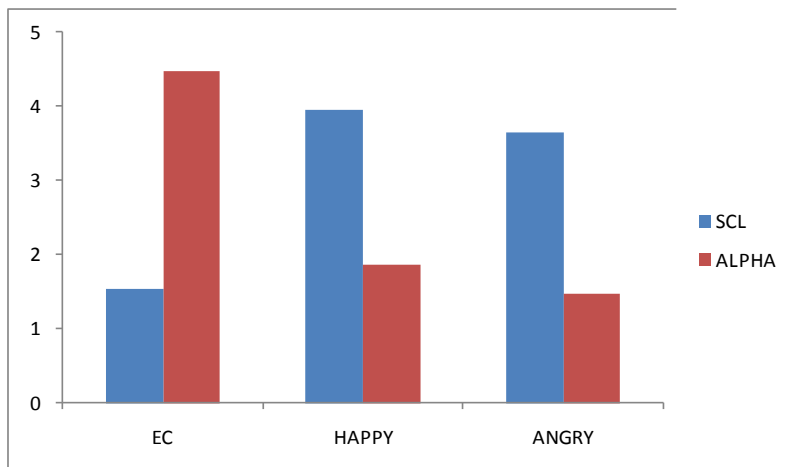Post-Doctoral Research Fellow Jacqueline Rushby

Figure 3: The negative correlation between SCL and alpha power as an index of arousal.

12. Identifying Auditory Emotion Perception

Jacqueline Rushby, Skye McDonald, Wan Yi Ho, Aneta Dimoska, Jaimi Iredale.

What this study was about:

Efficient emotion perception has been shown to be a significant predictor of success in social relationships and overall well-being. People infer emotions in speech through content, facial expressions and prosody which involves variations of tone and pitch. Prosody is relied on more often than facial cues to identify emotion in others; yet, few studies have examined the neural stages underlying vocal emotion perception.

This study examined how individuals perceive emotional prosody by looking at their responses to words spoken in an emotional tone compared to those spoken in a neutral tone. We also aimed to determine if responding was different for words which sound acoustically similar but differ in emotional connotations i.e. angry compared to disgust.

What we did:

Participants watched a silent movie while they were presented with a list of words spoken in either a happy, angry, disgust or neutral tone. They were then played another list of words from which they had to identify the emotion that was conveyed.

MMN
↓

We measured responses by calculating event related potentials (ERPs); the amount of activation in the brain when the words were presented. ERPs were also used to derive auditory emotional Mismatch Negativity (MNN). MMN indicates the brain's response to words which it perceives as different and demonstrates the ability to extract relevant information from stimuli.

What we found:

We found that the overall neural (MMN) response was significantly larger for words spoken in an emotional tone compared to words spoken in a neutral tone. This implies that people have the ability to identify emotional tones. There was no significant difference in MMN for words spoken in an angry compared to a disgust tone. In the future we would like to ascertain which areas of the brain are responsible for detecting emotional prosody and link this research with our clinical studies by comparing these results with the results of participants with Traumatic Brain Injury.

Post-doctoral research fellow Aneta Dimoska
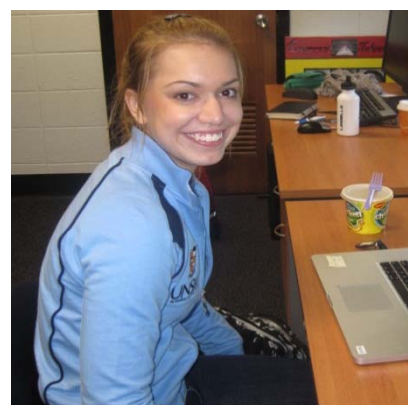
Research Assistant Jaimi Iredale

STUDIES IN PROGRESS AND NEW RESEARCH STARTING IN 2011

13. Emotion in Voice Matters: Advancing a neural model of auditory emotion perception

Jacqueline Rushby, Skye McDonald, Aneta Dimoska, Olivier Piguet, Nicole Pesa

What this study is about:

The ability to accurately perceive emotion in others is necessary for developing and maintaining positive social relationships. Speech is the most common source of information we use to determine emotion and emotional intent in others. While perception of emotional cues is relatively automatic and effortless for most of us, problems can arise when the literal content of a phrase does not match the emotional tone of the speaker; for example the phrase "you are a genius" spoken with a sarcastic tone. In such a case, cognitive processes are required to monitor and resolve these conflicting cues to understand the sarcastic inference.

Impaired understanding in these situations is common across a number of clinical disorders including Alzheimer's Disease, schizophrenia and traumatic brain injury. In this study, we aim to investigate the neural processes that are involved in emotion perception in healthy and brain injured adults using electroencephalogram (EEG), a technique that measures electrical activity from the brain. Understanding these processes will further our knowledge of efficient emotion perception, and may shed light on neural impairments that underlie social communication disorders.

Research Assistant Therese English

Research Assistant
Nicole Pesa

14. Communication Disorders After Brain Injury

Skye McDonald, Ali Gowland, Therese English, Thea Longman with Laurie Miller at RPAH.
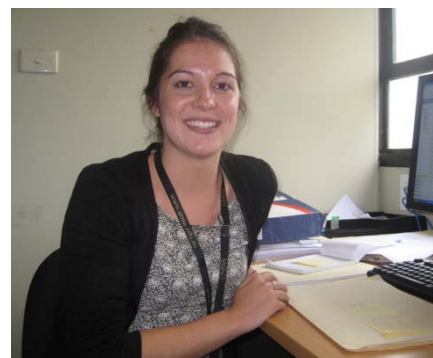
What this study is about:

Adults with brain injury, particularly frontal lobe damage, often experience difficulties in understanding others and making themselves understood. These communication difficulties occur despite their adequate language ability, which suggests that communication relies on a range of abilities. This study is looking at whether deficits in understanding other's beliefs and intentions contribute to the communication difficulties experienced by adults with frontal lobe damage.

What we are doing

We are currently recruiting participants for this study in conjunction with Laurie Miller at RPAH. We would love to hear from any adults with and without acquired brain injury who would be interested in taking part.

Participants will be presented with a variety of simple language tasks that vary in demands on working memory, flexibility and inhibition. This study will examine whether tasks that require an adequate understanding of other's beliefs and intentions lead to greater communication difficulties regardless of these demands.

Research Assistant
Thea Longman

15. Social Cognition in Adults with Asperger's Syndrome

Danielle Mathersul, Skye McDonald and Jacqueline Rushby.

What this study is about:

This study was first reported in the 2009 newsletter, and involves a number of ongoing studies. The first part of this study, investigating physiological responses to arousing and affective stimuli in individuals with Asperger's, is complete and is being prepared for submission to a scientific journal. Additional phases of this study are exploring the ability of individuals with Asperger's to make judgements regarding the trustworthiness of other individuals, as well as the role of motivation in their ability to make both simple and complex social inferences regarding the thoughts, beliefs, intentions and desires of others.

What we did:

In this study, adults with Asperger's and typically developing adults viewed highly arousing images of both a positive and negative nature. A loud, startling noise was also presented during approximately two-thirds of the images. Individual's autonomic responses (heart rate (HR) and skin conductance (SCRs; sweat rate and temperature changes)) were measured, as well as eye-blink startle responses.

What we found:

Adults with Asperger's demonstrated the typical pattern of startle eye-blink responses (larger startle to negative than to positive stimuli). However, whilst typically developing adults had larger SCRs to positive than to negative stimuli, adults with Asperger's did not differentiate by valence in their SCRs. These results suggest that individuals with Asperger's have highly subtle, specific disruptions to affective brain networks. In particular, it suggests that they fail to orient to positive, socially related stimuli, which may provide a possible explanation for their impairments in affective processing and social functioning.

To find out more about this study:

Contact Danielle Mathersul: dmathersul@psy.unsw.edu.au

Dr. Jacqueline Rushby and PhD candidate Danielle Mathersul

16. Emotion Perception Disorders Following TBI: An experimental approach to remediation

Skye McDonald, Robyn Tate, Leanne Togher, Cristina Bornhofen, Ali Gowland, Therese English and Matt Davidson

What this study is about:

For many people with severe Traumatic Brain Injuries (TBI) the capacity to read the emotions of others and monitor their reactions is lost. We have already demonstrated that remediation of emotion perception after TBI can be successful. What we are now interested in is whether specific strategies can be refined that improve remediation further, and in particular, whether specialised techniques used in the field of cognitive rehabilitation can be effective for people with different kinds of problems.

What we are doing:

In 2009 we commenced a treatment trial to determine whether we can improve people's ability to understand and recognise sarcasm. We have also been examining whether a short intervention can assist in understanding the emotional intonation of voice patterns. All participants are required to complete a battery of neuropsychological assessments to determine their eligibility for the treatment. Once they are deemed eligible, pre-treatment, post-treatment and one-month follow-up data is compared to analyse the efficacy of the treatment each participant receives.

Thus far, 18 participants have completed the treatment trial sourced from public advertisements, the Royal Rehabilitation Centre at Ryde Hospital, and the Brain Injury Community Services team of Westmead Hospital.

This research project is continuing in 2011. We are currently looking to recruit participants who have experienced difficulties understanding social situations and would like to be a part of the research project. We are especially seeking people with severe traumatic brain injuries who experienced their injury 9 months ago or longer and are now living in the community.

If you would like to participate in this study or for more information please contact us on: 0293853590, or m.davidson@unsw.edu.au

Research Assistant
Matt Davidson

17. Can elderly people with MCI improve their cognitive functioning by doing regular computer-based brain exercises?

Skye McDonald, Maurice Finn.

What the studies are about:

A series of studies is underway looking at the impact of computerised cognitive training on cognitive functioning in older people diagnosed with Mild Cognitive Impairment. Unfortunately there are no effective means of ameliorating cognitive decline for this group at present. Many studies that have been conducted have focused on teaching older people with cognitive impairment how to improve their recall by using memory strategies. The results to date have been disappointing, possibly because the learning processes required to learn and implement these strategies in daily life are compromised. Another problem with this approach is that a narrow focus on memory neglects other cognitive functions (for example, attention and processing speed) that play an important role in new learning and that are required for successful completion of everyday activities. Some researchers have suggested that cognition can be improved via the use of targeted computer-based exercises to stimulate brain plasticity processes. Studies in other clinical populations such as people with schizophrenia and preliminary studies in older people have indicated there may be some merit in this approach.

What we are doing:

The research is being conducted as part of a Ph.D in the School of Psychology at UNSW in conjunction with the Geoff and Elaine Penney Ageing Research Unit in the Department of Aged Care & Rehabilitation at Royal North Shore Hospital. An initial RCT pilot study was conducted in 2008 and 2009 with 16 participants recruited from the Memory Clinic and Geriatric specialty outpatient clinics. The software (courtesy of Lumosity Inc.) trained a range of cognitive functions including attention, processing speed, visual and spatial memory and executive functions.

What we found:

The first study indicated that the sample of elderly clients with MCI were able to improve on the trained tasks. The degree of improvement varied across tasks with more improvement seen on non-memory tasks. There was also some evidence of generalisation on a measure of visual sustained attention, an area of cognition known to be impaired in Alzheimer's disease and which is required for everyday skills such as driving and using automatic teller machines. There was no effect of training on self-reported memory functioning or on mood.

Next phase of research

There were several important lessons learned from the first study. Firstly, to optimise training gains and adherence to treatment, training should be conducted in a structured 1:1 outpatient setting. Second, given the heterogeneity of the MCI population, a tailored approach is required. Third, attempting to train memory too early can derail potential training gains. We have worked with Lumosity to modify the training program and are currently piloting this new software using a multiple-baseline single case experimental design.

PhD candidate Maurice Finn