



Why I study...

The effects of brain injury

THE truth is that I've been doing it so long, I'm not sure I can really remember why I started. But I'm really glad that I stumbled into this area of research.

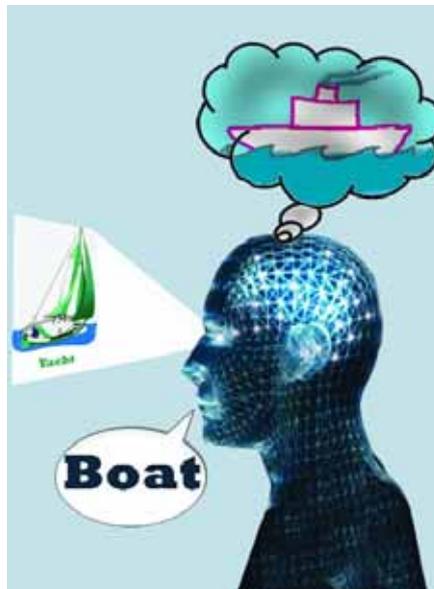
I do recall that the stumbling took a while, though I've always been interested in the brain, and still don't fully understand why so many of my colleagues like to draw a sharp boundary between facts and theories that pertain to psychology and those that are 'mere' neuroscience.

When I was a teenager I met someone at a party who considered himself a bit of a psychoanalyst (his father was a real one). He told me that smoking was an attempt to recapture the pleasures of the breast. Gobsmacked by this remarkable insight, and with no thought of questioning its evidence base, I started reading the works of Sigmund Freud. Mainly, I think I was hoping to impress people at parties in the same kind of way. For a while it worked, too. Then, gradually it began to dawn that there were problems with the underlying theory. Why was it only the pleasure of the sucking itself and not the taste that had to be perpetuated? Sarcastic questions like whether cigar or cigarette smoke is more like breast milk started to be troubling.

Noticing my interest in matters psychological, my mum brought back a book from a jumble sale called *Doctors of the Mind*. It had some terrifying stuff about the consequences of tertiary syphilis, which was a relatively common dementing illness in the pre-antibiotic era. This gave a glimpse of how brain disease might offer extraordinary insights into mental abilities, but mainly got me worried about STD. Not knowing the significance of a book's publication date, however, I had no idea

that the information was hopelessly out of date.

These twin influences led me to want to study psychology at university, and my schoolteachers' antipathy to this choice confirmed that it must be the right one. We didn't learn much about brains, and next to



nothing about neurological diseases, but I went on to do a PhD on Piagetian developmental psychology and in 1974 secured a lectureship at Aberdeen University.

In the end I wasn't completely happy with my PhD work, feeling that the gap between the kind of data I had collected and the abstract Piagetian theory was somehow too big. When I happened to mention to Hadyn Ellis that I was looking for something a bit different, he immediately made use of the developmental psychology training by setting me to work on a project investigating the development of right-hemisphere specialisation for face recognition. This involved testing how well children could recognise faces presented in the left and right visual hemifields. As background reading, I gradually became acquainted with the journals *Cortex* and *Neuropsychologia*, the split-brain studies, Freda Newcombe's long-term follow-up of D-Day veterans, and the rest of the huge

neuropsychological literature on how and where our mental abilities are represented in the brain. It was the beginning of a deep interest in such matters, and a long period of following Hadyn's advice. He has an infallible instinct for an interesting question.

It seems incredible now that divided visual field studies were for so many years one of the only methods for investigating organisation of function in the normal brain. They were at best somewhat indirect, so it was natural to look for something to complement them. The jump to investigating people with brain injuries was, I think, instigated by Andy Ellis, when we were both at Lancaster University in the late 1970s. Andy had latched on to key papers by John Marshall and Freda Newcombe and by Tim Shallice and Elizabeth Warrington, which set the agenda for what we now call cognitive neuropsychology.

Marshall and Newcombe (1966) described a brain-injured patient who made numerous semantic errors in reading words (e.g. reading 'yacht' as 'boat'). This was especially interesting because, in the 1960s, theories of reading nearly always assumed that the meanings of words were accessed by first deriving their sounds. However, 'yacht' does not sound anything like 'boat', so someone who misreads 'yacht' as 'boat' must have accessed the meaning without knowing how the word should sound.

Similarly, Warrington and Shallice (1969) saw that the preservation of some types of long-term memory in a person with a severe short-term memory impairment showed that not all long-term memories have to pass through the short-term store. The standard model that short-term memory forms a kind of bridge into long-term memory had to be wrong.

In both examples, a deficit caused by a brain injury was clearly inconsistent with the dominant psychological account. This was really exciting because most of the questions neuropsychologists were asking at the time were to do with where different abilities reside in the brain, not how they are achieved. Cognitive neuropsychology, which used patterns of impairment after

WEBLINKS

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brain injury as tests of models of normal function, quickly took off.

Dennis Hay, Andy Ellis and I tried to apply this approach to understanding face recognition. We made contact with local stroke clubs and began to put together a battery of tests of different aspects of face perception – age, sex, identity, expression, etc. Our big break came, though, when Freda Newcombe asked Dennis to help design tests for a new long-term follow-up of the veterans who had suffered shrapnel injuries on D-Day. Suddenly we were involved with a front-rank project, despite being complete novices. Working with Freda also showed us how much fun you can have in research, and how brain-injured participants are always a key part of the team, not objects of cold curiosity.

People got over-enthusiastic about cognitive neuropsychology. The explosion of interest probably peaked some years ago, and has been replaced by huge enthusiasm for functional imaging. Like many other universities, York has invested heavily in brain imaging, but we still need to carry on studying brain-injured participants too.

It is a matter of what is often called ‘converging operations’. All of the techniques we have in psychology are subject to problems of interpretation, but these interpretative problems tend to differ between different techniques. So a conclusion that is supported by a number of different types of evidence is more secure than one that has been arrived at through one technique alone. For this reason, my colleagues and I have sought in our own research to achieve parallel findings from a mixture of lab experiments, everyday errors, computational modelling, effects of brain injury, and now functional imaging. In our opinion, placing too much faith in any single approach will always increase the chance of misinterpretation.

The other factor that has kept me working with brain-injured participants is that it can be very rewarding. The human interest is always present, as is clear from the popularity of neuropsychology courses with students. Many begin by thinking they won’t like neuropsychology because of all the technical and anatomical information that has to be absorbed, but end up fascinated. Figuring out precisely why someone can’t do something we usually take for granted is often a satisfying intellectual challenge, needing a combination of careful reasoning and

willingness to follow a hunch at the right moment.

In rare instances, a person with a highly selective deficit can really make you change the way you think about something. I already mentioned the seminal influences of Marshall and Newcombe’s (1966) and Warrington and Shallice’s (1969) studies.

‘a person with a highly selective deficit can really make you change the way you think about something’

Their patients’ problems were clearly inconsistent with contemporary psychological models of reading and memory. In my own research, the patterns of impairment of face perception following brain injury have led me and colleagues to radically revise our ideas about how facial expressions are recognised (Calder *et al.*, 2001; Calder & Young, 2005). We are not finding the evidence we had expected of a dedicated visual pathway for interpreting all facial expressions. Instead, we are having to take seriously the possibility that current models underestimate the extent to which emotion recognition is an intrinsically multimodal process that involves constantly monitoring the environment for specific types of signal.

By their nature, many studies of the effects of brain injury depend on participants giving up significant amounts of time. Sometimes what is found out turns

out to be useful to them, but just as often it doesn’t. Instead, they take part in research for a variety of reasons – in the hope that the knowledge will eventually help others, to gain more insight into their own difficulties, or just because it makes for an interesting day out.

So there is often a substantial debt of gratitude we owe to our research participants. Some neuropsychologists have managed to repay this debt by linking scientific findings to rehabilitation strategies. Barbara Wilson is a shining example. But to do this successfully usually requires a special talent, a clinical background, and a dedication to making this your primary agenda. I don’t have any of those. Hopefully my efforts later this month (see box) will give something back to the kinds of people who have given so much time and inspiration to me throughout my career.

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A MARATHON EFFORT FOR STROKE VICTIMS

On Friday 13 January, my wife bought a copy of *The Times* to read on a train. She found it contained a competition for readers to train with four-times Olympic gold medallist Matthew Pinsent to run in the 2006 London Marathon on 23 April, to raise funds for the Stroke Association.



The marathon is quite daunting for a person in his mid-fifties, but many stroke victims have helped my research, and the thought of trying to do something in return by raising funds was irresistible. Strokes are the third biggest killer in the UK, and the biggest cause of disability. There is an urgent need for more research on the causes and treatment of strokes, and more funding to provide proper support for stroke survivors. Having researched the effects of brain injury for nearly 30 years, I know that the Stroke Association does outstanding work.

I heard in late January that I got chosen for the Times Flora pro.activ Marathon Challenge Team, leaving around 12 weeks to get

fully prepared to run the 26.2 miles. Now I’m keen to raise as much sponsorship as I can, on behalf of all of us whose research has been helped by people with brain injuries.

□ For more details visit http://timesonline.typepad.com/london_marathon_weblog/andy_young/index.html, or my fundraising page at www.justgiving.com/andy_young if you wish to offer your support.