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Psychology: The science of mind, brain, and behaviour

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The Psychology Foundation of Australia

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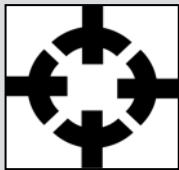
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Psychology: The science of mind, brain, and behaviour

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The Psychology Foundation of Australia

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Australian National University	Flinders University
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The goal of the Psychology Foundation is to promote scientific Psychology and to ensure the maintenance of the scientific basis of psychological practice.

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Foreword

FASTS is very pleased to be publishing *Psychology: The science of mind, brain and behaviour* as one of its Occasional Papers.

This series of papers was established in 1999 to allow ideas and issues to be developed in a style that is accessible to the general public but at a greater level of detail than is possible in the 800 word opinion pieces in the daily press.

As explained in the paper, psychology aims to build an account of human behaviour based on objective knowledge obtained from the theory-driven application of experimental procedures and observations under controlled conditions.

The same method is used in all scientific disciplines.

One difference is there are many people who make psychological claims and write for the popular media who do not necessarily follow the rigorous procedures of professional psychologists, however there are very few amateur physicists or embryologists.

Psychology is an important discipline as understanding human behaviour is a key to all of our economic and social progress. In the 21st century it is clear that the methods and techniques of psychological experimentation need to be highly multi-disciplinary. Magnetic resonance imaging, molecular biology and computer modelling all are part of modern psychology.

Psychology is a critical source of insights and knowledge in public health, neuroscience, neurology, radiology, cardiology, genetics through to education, gerontology and the social sciences. Indeed, recent analytical work seeking to 'map' contemporary science shows psychology is one of the seven 'hubs' of modern science along with mathematics, physics, chemistry, earth sciences, medicine and social sciences.¹

The Psychology Foundation of Australia, along with the Australian Psychological Society, has been a long and active member of FASTS.

We are very grateful to the Foundation for preparing this paper and hope it will be useful in promoting a better community understanding of the nature and benefits of the discipline of psychology.

Professor Tom Spurling
President , FASTS

September 2007

¹ Boyack, K.W., Klavans, R., & Börner, K. (2005), *Mapping The Backbone Of Science*. *Scientometrics*, 64, 351-374.

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Psychology: the science of mind, brain, and behaviour

“There exists a body of knowledge that is unknown to most people. This information concerns human behavior and consciousness in their various forms. It can be used to explain, predict, and control human actions. Those who have access to this knowledge use it to gain an understanding of other human beings. They have a more complete and accurate conception of what determines the behavior and thoughts of other individuals than do those who do not have this knowledge.

Surprisingly enough, this unknown body of knowledge is the discipline of psychology.

What can I possibly mean when I say that the discipline of psychology is unknown? Surely, you may be thinking, this statement was not meant to be taken literally. Bookstores contain large sections full of titles dealing with psychology. Television and radio talk shows regularly feature psychological topics. Newspapers and magazines run psychology columns. Nevertheless, there is an important sense in which the field of psychology is unknown.”

(Stanovich, *How to think straight about Psychology*. 2004, p. ix)

In this quote, Stanovich captures a dichotomy of contemporary psychology: a popular view which is a staple of media, and which is made of fads and fashions, and the scientific discipline of psychology which is built upon and is forming a cumulative body of knowledge. Like all sciences the discipline of Psychology aims to build an account of human behaviour based on objective knowledge obtained from the theory-driven application of experimental procedures and observations under controlled conditions. As in all sciences there are failures to achieve these goals but the aim is central to the discipline and enormous progress has been made.

Many people believe that the rules of human behaviour are common sense and that to live effectively is to understand these rules. However, too often those who do not study the science of psychology know and understand behaviour in the same sense that people once knew and understood that the earth was flat. Belief in that theory appeared consistent with the experience of day-to-day life but was false nevertheless. Many widely held beliefs and expectations regarding human behaviour are also demonstrably false. Indeed the number of such beliefs has, if anything, increased in recent years with intensive marketing of a large number of new quick fixes for the human condition. These include superficially appealing tests for dividing people into types widely used by employers for hire and promotion, diagnostics and therapies based on simple motor responses such as eye-movements, and a large range of strange and sometimes dangerous outdoor “team building” exercises. Only a scientific approach can reveal whether these beliefs and techniques are valid. Indeed, the discipline of Psychology tries to ensure that psychologists do not use techniques that lack validity according to scientific criteria (see Case 8 below). However, because of the confusion between psychology and the self-appointed expertise described above by Stanovich, psychologists are often blamed for any or all procedures that make psychological claims. This confusion is increased still further by the adoption of pseudo-scientific terms as marketing devices for dubious techniques.

The popular view of Psychology, that it is primarily concerned with abnormal behaviour and the treatment of mental health disorders, is incorrect. Psychology does include these topics, but most psychological research aims to understand normal behaviours and the psychological processes that determine them. Indeed, one cannot begin to make inroads into understanding abnormal behaviour without this knowledge. Disordered decision-making in psychosis, for example, cannot be understood without a knowledge of normal decision making.

The range of modern Psychology is extensive. Standard introductory texts have chapters on biological processes, human development and aging, sensation and perception, consciousness, learning and memory, language and thought, intelligence, motivation and emotion, personality, social behaviour, abnormal behaviour, stress and health, and psychological research methods, focusing on the application of scientific method to understanding psychological processes.

In each of these research areas a set of tools has been developed to measure behaviour precisely in order to make inferences about the underlying mental processes. As in any scientific discipline, this is a work still in progress, but psychology has now entered an era with an established set of experimental methods and an accumulated body of reliable knowledge. What is missing is the public recognition that Psychology is one of the essential sciences required to solve the problems faced by modern societies. The current priority areas of the Australian Research Council (An Environmentally Sustainable Australia, Promoting and Maintaining Good Health, Frontier Technologies for Building and Transforming Australian Industries, and Safeguarding Australia) all need behavioural change coupled with technological change to achieve the desired results. Behavioural change will be an important component in implementing solutions, whether it be reducing water consumption, changing farming practices to control soil salinity, changing driving behaviour to reduce the road toll, minimising the epidemic of depression, changing daily activity levels to reduce childhood obesity, diabetes and, ultimately, population health care costs, training airport security guards to detect subtle non-verbal cues, or in training vision to detect targets in X-ray images more effectively.

Why is Psychology the discipline that can help? Reliable results need the rigorous empirical approach which is central to Psychology. Every psychologist in the country is trained in scientific method, research design, and data analysis in each year of their six years of training. The Australian Psychological Society mandates this for every accredited psychology course. Research is not an optional add-on in Psychology, but an intrinsic part of the training. Indeed the discipline of Psychology has been evidence-based since first conceived as a science by Wundt in 1886. In Australia the professional training of accredited practitioners has also used an evidence-based approach for decades. Other professions, notably medicine, are now beginning to see the strengths of this approach.

The methods of Psychology are powerful and have been recognised as such by many other disciplines which have risen from the application of these methods to specific areas. An examination shows that Psychology has led to the development of other disciplines. As examples, scientific psychology is central to:

- Behavioural Economics: The tools of psychology have led to a reformulation of economic decision theory (see Case 2) and indeed most high profile Business schools now include psychologists on their staff.

- Psychiatry: Kraepelin, generally regarded as the father of Psychiatry, was profoundly influenced by his mentor, the experimental psychologist Wundt. Kraepelin introduced a highly influential classification system for psychiatric disorders and advocated the use of psychological tests in psychiatric research. Indeed this influence is currently being repeated with the rise of Cognitive Neuropsychiatry and its adoption of the methods of cognitive neuropsychology and experimental psychology. Schools of Psychiatry also include many psychologists on their staff.
- Cognitive Science: Principles from the psychology of cognition, perception and action have been blended with those from computer science, linguistics and philosophy in order to create applications such as expert systems, neural networks, computer learning algorithms, and intelligent robotics.
- Behavioural Neuroscience: The techniques and theory developed in Psychology over many years for measuring behaviour and behavioural change in animals are now used in combination with drugs, controlled brain lesions, and a range of physiological measures to explore the biological basis of psychological processes such as fear, anxiety, and addiction. The use of animal models has given critical insights into human problems. Psychology also provides the essential tasks for the effective use of tools such as functional Magnetic Resonance Imaging and Transcranial Magnetic Stimulation and for understanding the results of applying these techniques. In each case the power of the technique is significantly enhanced when combined with tasks developed to measure psychological processes. Psychological theory is also indispensable for interpreting the effects of brain damage and disease.
- Ergonomics: The application of scientific information about psychological processes to the design of objects, systems, and environments optimises human performance. Psychological research also provides critical information on behavioural limitations which has been fruitfully combined with information from other disciplines such as anatomy, physiology, and design.

The methods of the discipline are also now incorporated on a regular basis in human geography, political science, agriculture, community medicine, social work, nursing, education, computer science, and anthropology as well as in humanities such as English, history, and philosophy (although often these latter disciplines use historical accounts rather than the currently established knowledge). Psychology is truly an enabling discipline of behaviour, although the coverage of its methods by other disciplines is often patchy. Benefits would likely accrue from more systematic application.

The recognition of the broad applicability of psychology is also seen in the staffing of Government-funded centres such as the National Drug and Alcohol Research centre at UNSW, and the NHMRC-funded Centre for Mental Health Research at ANU, where psychological research skills are dominant in their activities.

The Challenge:

Australia is very well regarded internationally in psychological science, and its leading departments of Psychology contribute extensively to the empirical research base of the discipline. The challenge faced is to increase the public awareness of the achievements of scientific psychology and to bring these achievements into the development of public policy. The knowledge base of psychology, like most scientific knowledge, is taught in universities and published in academic journals, and hence is less available than more popular 'psychological' writing, which is often not based on scientific research nor subject to any expert scrutiny. From Stanovich again:

"Despite much seeming media attention, the discipline of psychology remains for the most part hidden from the public. The transfer of "psychological" knowledge that is taking place via the media is largely an illusion. Few people are aware that the majority of the books they see in the psychology sections of many bookstores are written by individuals with absolutely no standing in the psychological community. Few are aware that many of the people to whom television applies the label psychologist would not be considered so by the American Psychological Association or the American Psychological Society. Few are aware that many of the most visible psychological 'experts' have contributed no information to the fund of knowledge in the discipline of psychology. The flurry of media attention paid to 'psychological' topics has done more than simply present inaccurate information. It has also obscured the very real and growing knowledge base in the field of psychology. The general public is unsure about what is and is not psychology and is unable to independently evaluate claims about human behavior."

The challenge has been recognised by the Association for Psychological Science which has introduced a new journal *Psychology in the Public Interest* to disseminate psychological knowledge which has immediate practical implications. Each issue contains one long commissioned article which evaluates the current scientific status of knowledge on a topic of popular interest. Topics tackled so far include 'The psychology of confessions', 'Beyond money: towards an economy of well being', 'The influence of media violence upon youth', 'Psychological science can improve diagnostic decisions', and 'A critical assessment of child custody evaluations. Limited Science and a flawed system'. In some cases there are clear conclusions, and in others the conclusions are complex; but in all cases, the issues are decided on the weight of scientific evidence, and not opinion or received wisdom. The next section presents brief illustrations of instances where psychological research has made – and continues to make – a significant contribution to important issues.

The Future:

Where to next for Australian Psychology? This country lags the USA by a decade or more in its recognition of the value of the science of Psychology. This is shown by two programs in the USA. The first is the *Human Capital* initiative, which has promoted fundamental scientific research in areas leading to enhanced human performance in its broadest sense, at work, in education, in leisure, and in the function of a community (<http://www.psychologicalscience.org/teaching/hci/>).

The second initiative is the current *Decade of Behavior* initiative, which shares similar goals in promoting human welfare through the application of basic research (<http://www.decadeofbehavior.org/index.cfm>). Both initiatives stress the need to use reliable scientific research as a basis for answers to questions on behavioural matters. Psychology is the primary discipline in this regard and should be consulted in preference to highly confident but poorly informed lay people.

There is a need for an Australian initiative to extract maximal benefit from the strength of psychology. Its value sometimes goes unrecognised in just those places where it could make a substantial contribution. As an example, the original PMSEIC working party on *Diseases of the Mind and Brain* contained no psychologists. More recently a clinician has been added, but not a research psychologist. The national *Beyond Blue* initiative has raised the awareness of the incidence of depression in this country and its debilitating impact on peoples' lives and on economic performance. The primary government response has been to try to train busy GPs in Cognitive Behaviour therapy and hope the GPs can fit it into their schedules. It is more efficient and effective to call on six-year trained psychologists who are expert in the application of the therapy and very recently the government has moved to recognise and increase their role. This is an excellent development in the mental health area.

However, a lack of understanding that scientific psychology with its powerful methods exists is a major impediment in solving human problems in areas which are not associated with psychology in the mind of the public. Examples are organisational behaviour (including staff selection and training), forensic psychology (including issues such as eye-witness testimony, police behaviour, and jury decision making), the development of human-compatible design (including driving, aviation and military environments, computer displays and industrial devices, instructions, and reading materials). Human society in all of its manifestations is a direct result of human behaviour and just as in technical areas it is taken for granted that the body of scientific knowledge is the first port of call when addressing major issues, the principles of scientific psychology should be the first port of call for understanding behaviour. The current paper gives some samples of the application of psychological knowledge. To obtain full benefit, more consistent application of this knowledge is required and, ideally, an Australian equivalent of the human capital initiative should be created to drive this application.

Psychology making a difference – some recent examples

Case 1: How should reading be taught?

Australia has recently re-entered the “great debate” about teaching reading (Chall, 1967, 1996) that has plagued literacy education for decades. Following a national enquiry, Brendan Nelson, the former Federal Minister for Education, indicated his intention to mandate *phonics* as the primary method of early reading instruction in Australian schools. Co-incident with Nelson’s decision, the British Education Secretary accepted the recommendations of a review of teaching reading in the UK, declaring that “phonics is central...it should be taught first and fast”. The National Reading Panel established by the Bush administration is also promoting the inclusion of phonics in US reading programs.

The evidence base underpinning the recent re-emergence of phonics comes from cognitive psychology. In a paper entitled “*How Psychological Science informs the teaching of reading*”, an influential group of US reading researchers (Rayner, Foorman, Perfetti, Pesetsky & Seidenberg, 2001) summarised three decades of psychological evidence about reading as leading to two “inescapable” conclusions: “that mastering the alphabetic principle [the relationship between letters and sounds] is essential to becoming proficient in reading, and... that instructional techniques, namely phonics, that teach this principle directly are more effective than those that do not” (p. 68).

The alternative *whole language* approaches to reading instruction that have dominated reading curricula since the 1980s emphasise the importance of drawing children’s attention to the meaning of text rather than encouraging them to focus on lower levels of language like letters and sounds. Reading is argued to be a natural extension of language that will be acquired spontaneously and effortlessly as children learn to understand speech, as long as they are “immersed” in meaningful written language. Explicit training in phonics is thought to be unnecessary and potentially damaging because it distracts children from meaning.

Psychological research challenges the assumptions of the whole language approach by showing that reading does *not* rely on the same natural, biologically-prepared process as learning about speech. Written language is a human invention that developed as recently as 5,000 years ago and required our ancestors to develop new insights about how sounds and meanings could be represented in a permanent, reproducible form. Similarly, learning to read and write requires each child to gain cognitive insights into spoken language and its relationship to the symbols of their written language that were not needed to learn spoken language and are unrelated to intelligence (Castles & Coltheart, 2004). Many children achieve these insights easily regardless of how they are taught to read, but as many as 30% of children experience difficulty in “cracking the alphabetic code” (Hindson, Byrne, Fielding-Barnsley, Newman & Shankweiler, 2005) and need systematic, explicit instruction in phonics to achieve it. Classroom studies since the 1960s have consistently shown that early phonics programs yield more effective reading acquisition than instructional methods that emphasise meaning at the level of words and sentences. The advantages of phonics programs are particularly marked for children who are at risk for reading difficulty, either because of genetic factors or an impoverished environment.

In the light of this strong evidence for the effectiveness of phonics, it is difficult to understand why it continues to be so strongly resisted by many educational practitioners who claim that phonics reflects “old-style”, “back-to-basics teaching” that is grounded in conservative educational and political philosophies (Sydney Morning Herald, 3-4 December, 2005). The explanation for the politically-charged nature of the debate lies in educational philosophy rather than scientific evidence (Stanovich, 2000). Phonics methods are rejected because they are identified with prescriptive, teacher-led, rote-learning methods that are seen as incompatible with constructivist educational philosophies which emphasise, child-centred, discovery-oriented learning methods. Advocacy of whole-language approaches is based on “beliefs about the empowerment of learners and teachers” and the “acceptance of all learners and the languages, cultures and experiences they bring to their education” (Whole Language Umbrella, 2000; cited in Rayner et al., 2001) rather than on evidence about the determinants of successful reading.

The available psychological evidence gives very clear answers to the question of “what works” in early reading instruction: programs that develop phonics skills should form part of early reading instruction for all children, and some children need more explicit phonics training than others. Educators who deny that children who are taught phonics directly have better outcomes in reading, spelling and comprehension, on the basis of their philosophical or political beliefs, are not only ignoring decades of psychological research, “they are also neglecting the needs of their students” (Rayner et al., 2002).

Castles A. & Coltheart, M. (2004). Is there a causal link from phonological awareness to success in learning to read? *Cognition*, 91, 77-111.

Rayner, K., Foorman, B. R., Perfetti, C. A., Pesetsky D. & Seidenberg, M. S. (2001) How psychological science informs the teaching of reading. *Psychological Science in the Public Interest*, 2, 31-74.

Rayner, K., Foorman, B. R., Perfetti, C. A., Pesetsky D. & Seidenberg, M. S. (2002) How should reading be taught? *Scientific American*, March, 71-77.

Stanovich, K. E. (2000) *Progress in understanding reading: Scientific foundations and new frontiers*. New York: Guilford.

Case 2: Decision making

The psychologist Daniel Kahneman won the Nobel prize for economics in 2002 for his work on intuitive judgment and choice. This work was done with another psychologist, Amos Tversky, who sadly died before the prize was awarded. They showed that most people, including statisticians and Ivy League college students, are prone to basing their decisions and judgements on immediate intuitions rather than on reasoning. Kahneman and Tversky set out to explore through experiments the properties of intuitive decision making which often leads to irrational and inconsistent positions. Using economic examples, they found that people are ‘loss averse’. These tendencies lead to ‘framing effects’, whereby the answer given to a problem can be entirely different if it is couched in terms of losses rather than gains. This is true for medical decisions as well as economic ones; different treatment choices can be invoked in both medical practitioners and patients by describing the outcome as a 90% survival rate or as a 10% mortality rate.

Framing is but one example of many factors they have investigated which form the basis of 'Prospect Theory', which Kahneman's Nobel citation said "*can capture behavioural patterns during human decision making better than traditional economic theory, which assumes rational choice among alternatives*". Kahneman and Tversky's work has led to the development of the new discipline of Behavioural Economics.

Intuitive judgements are based on whatever comes most easily to mind: "People tend to use a limited number of heuristic principles that reduce the complex tasks of assessing probabilities and predicting values to simpler judgmental operations" (Kahneman 2002). An example of an heuristic is 'availability' – people use easily accessible information in a superficial way to make a judgment. Kahneman gave a good example in his Nobel Lecture: A bat and a ball cost \$1.10, and the bat costs \$1 more than the ball. How much does the ball cost? Fifty percent of Princeton students said 10 cents. If you do not think about it closely, \$1.10 divides neatly into 1 dollar and 10 cents so the answer seems superficially right. Judgments are also subject to common biases. Examples are a tendency to overestimate the frequency of events that are easy to recall and a tendency to be overconfident in one's judgment once made, even if the information on which it is based is uncertain. Uncertainty is not well represented in intuitive judgments.

Why do people not correct intuitive judgments? In order to answer this question Kahneman draws on his earlier work as a psychologist working in perception, which is fast, immediate, effortless, automatic, parallel and associative. Reasoning, on the other hand, is slow, effortful, rule-governed, serial and controlled. Intuitive judgments belong to the first system and are perception-like, but without the unconscious brain processing that results in perception usually achieving the correct result. People are capable of invoking the second system (reasoning) but generally choose not to do so unless they are made aware of the imperfections of intuitive judgments.

Without studying what people do, it is easily assumed that humans make rational judgments, and this assumption was the basis of economic theory for many years. The strategies people actually use in making complex decisions are now a major focus of research in cognitive psychology. Since his Nobel Prize, Kahneman has moved onto research on the determinants of happiness, an area of psychology that is beginning to have a major influence on economics and public policy.

http://nobelprize.org/nobel_prizes/economics/laureates/2002/kahneman-lecture.html

Case 3: The reliability of human memory

Our memory guides many of our everyday judgments, opinions, and actions. Most of us are probably all too aware from everyday experience that our memory can fail us at key times and that it does so regularly – we misplace our car keys, we forget to buy something at the shops, and we can't remember someone's name.

But from time to time many of us have memory failures that are far more significant and yet are not clearly brought to our attention. These failures take various forms.

The pioneering work of Elizabeth Loftus provides many examples of memory distortions in which a person's memory of an event differs importantly to what actually occurred. Such distortions can be readily induced by subtle bits of misinformation, for example in the wording used to question a person.

Significant memory distortions occur even in the absence of misleading suggestions. Research done in Australia by a PhD student, Michelle Tuckey, showed that when witnesses view ambiguous events they are likely to report false details that are consistent with the expectations they hold. This research showed that people expect to see weapons in bank robberies and, when they witness a bank robbery in which no gun is visible, they are likely to falsely report the presence of a gun. Memory errors such as this can have serious consequences in legal settings.

Not only do people's memories of events become distorted, we now know that people can develop entirely false memories for events that have never occurred. Researchers have successfully 'implanted' memories for all sorts of (often bizarre) events that never occurred nor could have possibly occurred. These memories can be very vivid and confidently held, and people are often extremely surprised when told that the memories are false.

Gerrie, M.P., Garry, M., & Loftus, E.F. (2005). False memories. In N. Brewer & K.D. Williams (Eds.), *Psychology and law: An empirical perspective*. New York: Guilford.

Tuckey, M.R., & Brewer, N. (2003). The influence of schemas, stimulus ambiguity, and interview schedule on eyewitness memory over time. *Journal of Experimental Psychology: Applied*, 9, 101-118.

Case 4: Confidence in judgments

In a courtroom a confident witness can be highly persuasive, for judges, lawyers, and jurors alike. Research using simulated trials shows that testimony given with high confidence is likely to be much more persuasive for jurors than the same testimony given with low confidence, even when there are significant problems (such as inconsistencies) with the rest of the testimony. The implication is clear: if a witness to a crime identified a suspect from a police line-up, and then later in court said they were 100% confident that this person was the offender, the evidence would count heavily against the accused.

Why should we be concerned about this? We know from the now well-documented DNA evidence that mistaken eyewitness identifications are one of the major causes of wrongful conviction. Furthermore, we know from laboratory and field studies that a variety of factors can conspire to produce mistaken identifications, indicating that eyewitness identification evidence needs to be carefully examined.

But shouldn't we be able to trust witnesses who express supreme confidence in their identification in the courtroom? Unfortunately, no. Recent research conducted by Carolyn Semmler and Neil Brewer from Flinders University and Gary Wells (from the USA) has shown that expressions of confidence made in the courtroom are likely to be seriously inflated when compared with the witness's actual confidence at the time they first identified the suspect.

Witnesses who make an identification of a police suspect are liable to receive some kind of feedback from police or other witnesses that suggests to them that they have picked out the offender. This feedback can be quite explicit (“You got the guy”) or it might be more subtle, such as a nonverbal indication. One effect of feedback like this is to markedly increase the witness’s confidence in their identification. Another effect is that the witness’s perceptions of things such as how good a view they had of the offender at the time of the crime, how closely they were attending, and so on, are also adjusted upwards. The consequence is that when the witness testifies in the courtroom, their reports of their confidence and their perceptions of the witnessed event have been coloured significantly by feedback conveyed just after the identification.

Given how persuasive identification evidence and witness confidence can be in the courtroom, eyewitness researchers now strongly argue that any expressions of witness confidence, and indeed of any other perceptions of the event, should be recorded at the time the identification test is conducted rather than at some later time when they are likely to have been biased by various social influences.

Semmler, C., Brewer, N., & Wells, G.L. (2004). Effects of postidentification feedback on eyewitness identification and nonidentification confidence. *Journal of Applied Psychology*, 89, 334-346.

Case 5: What happens when the situation implies it is acceptable to harm others?

In 1971, a team of psychologists designed and executed an unusual experiment that used a mock prison setting, with college students role-playing prisoners and guards to test the power of the social situation to determine behaviour. The research, known as the Stanford Prison Experiment, has become a classic demonstration of situational power to influence individual attitudes, values, and behaviour. The transformations of character in many of the participants in this study were so extreme, swift, and unexpected that the study, which had been planned to last two weeks, had to be terminated by the sixth day.

The Stanford Prison Experiment demonstrated the surprisingly powerful effect of social forces on the behaviour of normal, healthy participants. Philip Zimbardo’s study (Zimbardo, Haney, Banks, & Jaffe, 1973) wanted to determine what prison-like settings bring out in people when the experiences and personal characteristics that people bring into prisons are not present. They sought to discover the extent to which the violence and anti-social behaviours often found in prisons can be traced to the ‘bad apples’ that go into prisons and to the ‘bad barrels’ (the prisons themselves).

College students from all over the United States who answered an advertisement for participants in a study of prison life were personally interviewed, given a battery of personality tests, and completed surveys that enabled the researchers to select only those who were mentally and physically healthy and well adjusted. The participants were randomly assigned to role-play either prisoners or guards in the simulated prison. A full description of the methodology, chronology of daily events, and transformations of character that were revealed by this research can be found at: <http://www.prisonexperiment.org>

The study found that many of the normal, healthy mock prisoners suffered such intense emotional stress reactions that they had to be released in a matter of days; that most of the other prisoners acted like 'zombies', and totally obeyed the demeaning orders of the guards; and that the distress of the prisoners was caused by their sense of powerlessness induced by the guards who began acting in cruel, dehumanizing, and even sadistic ways.

This Stanford Prison experiment has become one of psychology's most dramatic illustrations of how good people can be transformed into perpetrators of evil, and healthy people can begin to experience pathological reactions that are traceable to situational forces. Its messages have been carried in many textbooks in the social sciences, in classroom lectures across many nations, and in popular media renditions. The phenomena seen in the Stanford Prison experiment are not specific to the North American society, and have been replicated in an Australian sample by Syd Lovibond at the University of NSW (Lovibond et al., 1979). The direct parallels between the behaviour of the mock guards and that of the American Military Police army reservists in Abu Ghraib Prison, have propelled this research into the national dialogue. The situational analysis of the Stanford Prison Experiment redirects the search for blame from an exclusive focus on the character of an alleged few 'bad apples' to systemic abuses that were inherent in the 'bad barrel' of that corrupting prison environment.

Haney, C. & Zimbardo, P.G. (1998). The past and future of U.S. prison policy. Twenty-five years after the Stanford Prison Experiment. *American Psychologist*, 53, 709-727.

Lovibond, S.H., Adams, M., & Adams, W.G. (1979) The effects of three experimental prison environments on the behaviour of non-convict volunteer subjects. *Australian Psychologist*, 14, 273-285.

excerpt from APAOnline: <http://www.psychologymatters.org/spe.html>

Case 6: Roadway Safety

Imagine that you're driving down an unfamiliar highway one rainy night. You're trying to read the highway signs as you look for the correct exit, but you're having problems reading them from a distance, and the glare of your headlights and others isn't making the task any easier. Suddenly, you hear a fire engine's siren, but because it's dark, you don't see the bright red truck.

What is the cause of these visual problems, and can anything be done to improve the situation? Researchers in the field of human factors and ergonomics are working on the answers. Research in these fields examines the interface between humans and their environments with an emphasis on safety, comfort, usability, and productivity. The field is multidisciplinary, with research done by psychologists, engineers, industrial designers, medical doctors, and a range of other professionals.

Much of human factors and ergonomics research relies upon psychological research done on human perception. Our eyes have two types of light-sensitive receptor cells, rods and cones. The rods are primarily brightness receptors, work best in dim light, and can not signal colour information.

Cones are sensitive to different wavelengths and work best under bright lighting conditions. Because cone responses vary with wavelength, some colours are easier for us to see than others in low light levels. We are most sensitive to greenish-yellow colours under dim conditions, making lime shades easiest to see in low lighting levels. Awareness of these perceptual principles is causing industry to modify some long-standing traditions. Fire engines, which have been traditionally red, are now being produced in a lime-green shade, making them easier to spot at night. Researchers comparing the accident rates of red and lime-green fire engines found that the red fire engines were more than twice as likely to be involved in accidents! Many communities are switching from red to lime-green, applying the findings of human factors and ergonomics research and saving lives.

Psychologists have also made an important and life-saving contribution to the design of automobiles through the location of brake lights. In 1974, the psychologist John Voevodsky created a high-mounted brake light system for motor vehicles that proved so effective at reducing collisions, injuries, and costs associated with accidents that the system was adopted as a standard for the auto industry. The effectiveness of the brake light system has been attributed to its location within the driver's line of sight, to the greater attention drivers pay to the triangular formation of the two standard lights at the left and right of the vehicle and the high-mounted light, and, at night, to the availability of a light signal that is separate from running lights and turn signals.

Solomon, S.S., & King, J.G. (1985). Influence of color on fire vehicle accidents. *Journal of Safety Research*, 26, 47.

Voevodsky, J. (1974). Evaluation of a deceleration warning light for reducing rear-end automobile collisions. *Journal of Applied Psychology*, 59, 270-273.

Extract edited from *Behavior Matters: How research improves our lives*. A publication of the Decade of Behavior Initiative (pp. 3-5; see www.decadeofbehavior.org)

Case 7: Behaviour Genetics

As a society we have become more open about the different types of mental illness that affect people. A common question concerning mental illness is "What causes it?"

In the area of eating disorders, such as anorexia nervosa and bulimia nervosa, theories of causality abound. Families have often been blamed for the emergence of eating disorders in their adolescent children, and other suggested culprits have been the media, western culture, and peer relationships.

Research over the last decade has also focused to a large degree on the contribution of genes to the development of eating disorders. The question then becomes "To what extent do genetic and environmental factors contribute to eating disorders?". Behaviour genetics, which includes the study of twins and their families, offers the means to answer this question. One study in this area comes from Tracey Wade and Marika Tiggemann from Flinders University, Nick Martin and Sue Treloar in Queensland, and colleagues from the USA.

They studied eating problems in a group of almost 2,000 adult female twins, and found that genes accounted for 59% of the disordered eating and non-shared environment the remainder. Other evidence suggests that the genetic action is likely to consist of a number of different genes that interact with different environments.

These findings help us move from simplistic single-cause models of eating disorders to a greater appreciation of the complexity of the causation of mental illness. It also poses further important questions that the behaviour genetics field is well positioned to answer, such as: What specific genetic actions are associated with the development of eating disorders? What are the specific environments that trigger genetic susceptibility? To what degree do risk factors for one type of eating disorder influence the development of a different type of disorder?

Wade, T., Martin, N.G., Neale, M.C., Tiggemann, M., Treloar, S.A., Bucholz, K.K., Madden, P.A.F. & Heath, A.C. (1999). The structure of genetic and environmental risk factors for three measures of disordered eating. *Psychological Medicine*, 29, 925-934.

Case 8: Assisted communication

The modern world is awash with practices and techniques that are claimed to optimize human performance and well being, usually without supporting evidence and often with an implicit assumption of scientific credibility. In his book *How to think straight about psychology*, Keith Stanovich describes the work of two Australian psychologists, Bob Cummins and Margot Prior (1992), in debunking a belief that high-level language communication could be revealed in autistic children by using “assisted communication”, a technique whereby an assistant supported the child’s hands and arms over a keyboard. The technique was believed to facilitate communication by overcoming problems such as motor impairment that prevented independent communication. Despite the contradiction to 50 years of psychological research that had documented profound communication deficits in autism, the supposed communication was fuelled by uncritical media interest and spread like wildfire.

Assisted communication turned out to be no more than a modern instance of the “Clever Hans” phenomenon, in which a horse appeared to be able to solve arithmetic problems posed by his trainer by tapping out the answer with his hoof. Clever Hans, of course, couldn’t do arithmetic: he was responding to subtle cues given by the trainer. In a similar way, the critical psychological analysis by Cummins and Prior showed that the assistants were not merely facilitating communication of their clients, but guiding and directing it.

Cummins, R.A., & Prior, M. (1992). Autism and assisted communication: A response to Biklen. *Harvard Educational Review*, 62, 228-241.

Stanovich, K.E. *How to think straight about Psychology*. (2004). Boston: Allyn & Bacon.