"It Gets Out The Truth": Analysing the Place of the P300 Concealed Information Test in the New Zealand Legal Landscape

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¹ Dr Lawrence Farwell, describing his new Brain Fingerprinting test to a reporter. See Beth Dalbey "Farwell's Brain Fingerprinting traps serial killer in Missouri" (17 August 1999) Cut Bank Pioneer Press www.cutbankpioneerpress.com>.

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Table of Contents

Introd	ductionduction	1
Chapt	ter I The P300 Concealed Information Test	4
A	What is the P300 Concealed Information Test?	4
В	Dr Lawrence Farwell's 'Brain Fingerprinting' Test	5
C	Current Use of the P300 Concealed Information Test	6
1	6	
2 3	6	
D	What Role could the P300 Concealed Information Test Play in New Zealand?	
Chapt		
A 1	The Relationship Between Legal Validity and Scientific Validity Legal tests of validity	
В	Questions of Scientific Validity	
В		
	(a) The unknown effects of variables on the P300 CIT	12
2	Arguments in favour of scientific validity	14
\mathbf{C}	Hurdles to Admissibility	
1	11	
2		
Chapt	ter III The New Zealand Approach to Novel Scientific Evidence	19
A	The Basis of the New Zealand Approach	19
В	The Evidence Act 2006 and the P300 CIT	20
\mathbf{C}	The Current New Zealand Approach	21
Chapt	ter IV Exploration of 'Comparative Advantage'	26
A	What Standard Should the P300 Concealed Information Test be Held To?	
1		
	(a) The innocence problem	
	(b) The right to silence	
2		
	(a) Limits of the technology: the fallibility of memory	
	(b) Limits of the technology: mind-altering substances	
	(c) Limits of the technology: jury over-valuation	
	(d) Conclusion	
В	How Our Current System Influences the Potential Incorporation of the P300 Con	
Info	ormation Test	31
Chapt	ter V Matters of Legal Rights	33
A	Rights That the P300 Concealed Information Test May Interfere With	33
1		
2	Tort	34
В	Coercion	
1	Are P300 CIT results physical or testimonial evidence?	35

(a) The pro-use approach	37	
(b) The rights-focussed approach	37	
2. International jurisprudence: what does it suggest?		
(a) Support for the pro-use approach		
(b) Support for the rights-focussed approach	39	
3. The Treaty of Waitangi		
4. Justifiable coercion		
C Selvi: A Case Study	41	
Chapter VI Matters of Practicality	44	
A Matters for Consideration	44	
1. Overcoming the barriers	44	
2. International use of concealed information tests		
3. A potential framework for use of the P300 CIT	45	
4. Teina Pora: a case study	46	
B Is There Merit in Advocating for the P300 Concealed Information T	est?47	
Conclusion		
BibliographyBibliography		

Introduction

New Zealand courts do not get all of their verdicts correct. Blackstone's Ratio states that it is better that ten guilty individuals walk free than one innocent is sent to prison,² but a 2006 report suggests that there may be as many as 20 people wrongfully imprisoned in New Zealand jails.³ Although uncommon, wrongful convictions do happen. Teina Pora spent 21 years in prison before his conviction was quashed by the Privy Council.⁴ Arthur Allan Thomas spent nine years in prison before being granted a Royal Pardon,⁵ Rex Haig served 10 years,⁶ and David Bain served 14 years.⁷ All of these men were pardoned, but not before they had spent a significant portion of their life behind bars. David Tamihere and Michael October served 20 years and 11 years respectively before being released, but both maintain their innocence.⁸ Scott Watson and Mark Lundy both remain in prison, having been there for 22 years and 18 years respectively.⁹ Both have appealed repeatedly, and both maintain their innocence.

It is clear that there is room in the New Zealand legal system for new forms of evidence, and given the incredible rate that science is progressing at, it is logical to turn to the scientific field for new technologies and techniques. One such technology is the P300 Concealed Information Test (P300 CIT), a scientific technique that analyses brainwaves to assess whether certain information is present in the brain. This technology was discovered in 1988. Since then, it has garnered significant interest from scientists, and later legal academics and governments, because of its potential for use in the legal system. In 2001, the United States Government Accountability Office wrote a report outlining this technology's potential place in the legal system, and in 2003 it was considered for the first time in the Supreme Court of Iowa. Over 10 years later, in 2015, the New Zealand Law Foundation funded a study led by legal academic Professor Robin Palmer to conduct preliminary research into the possibility of using the P300

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² William Blackstone Commentaries on the Laws of England (2nd edition, Collins & Hannay, Philadelphia, 1830).

³ Sir Thomas Thorp *Miscarriages of Justice* (Legal Research Foundation, Auckland, 2005).

⁴ Pora v Attorney-General [2017] 3 NZLR 683.

⁵ Royal Commission on Thomas Case, Re [1982] 1 NZLR 252.

⁶ Haig v R CA 267/04 12 June 2006.

⁷ Bain v R PC 200760881, 10 May 2007.

⁸ Tamihere v R CA 428/90, 21 May 1992; October v R CA 477/95, 31 Jul 1996.

⁹ Watson v Chief Executive of Department of Corrections [2015] NZHC 1227; R v Lundy HC Palmerston North T 13-01, 12 April 2002.

¹⁰ JP Rosenfeld, B Cantwell, VT Nasman, S Ivanov and L Mazzeri "A modified, event-related potential-based guilty knowledge test" (1988) 42 International Journal of Psychophysiology 157.

CIT in the New Zealand criminal justice system, and the results were positive.¹¹ The cases described above provide clear examples of how the P300 CIT, if scientifically valid, might provide a valuable service for the law: by providing evidence that could contribute to improving the accuracy of verdicts. If Pora, Haig, Thomas and Bain had been able to take a P300 CIT, they might not have had to spend years behind bars for crimes they were later pardoned for. If introduced now, Tamihere, October, Watson and Lundy would have another piece of evidence on which they could appeal their innocence, or which could support their sentences.

This dissertation will draw on international and domestic legal material to build a background of how the P300 CIT has been considered in both the scientific and legal fields. It will consider the challenges that the P300 CIT could face in New Zealand law, and will weigh the legal and ethical issues it presents against the value it may provide to the New Zealand legal system.

Chapter I introduces the P300 CIT. It explores how it has been used in the United States in the key cases of *Harrington*, ¹² *Slaughter* ¹³ and *Grinder*, ¹⁴ and draws on those cases to consider the possible role that the P300 CIT could play in New Zealand. Chapter II considers the validity of the P300 CIT. It maps the relationship between scientific and legal validity, and explores the arguments both against and in favour of the P300 CIT. It concludes by outlining the hurdles to admissibility that the P300 CIT is likely to have to overcome before it can be incorporated into the law. Chapter III considers the New Zealand approach to novel scientific evidence. It starts by describing the historical tests of novel scientific evidence and the current New Zealand test, before narrowing the focus to how the P300 CIT would sit under the Evidence Act 2006. Chapter IV canvasses the comparative advantage standard posited by legal academic John Danaher, and uses it as a framework to assess how the P300 CIT could fit into New Zealand law as it currently stands. Chapter V explores the more ethical issues associated with the P300 CIT. It outlines the legal rights that the P300 CIT has the potential to interfere with, and, with assistance from international jurisprudence, considers the problem of coercion. Finally, chapter VI considers how the P300 CIT has been used internationally, and the framework this could

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¹¹ Robin Palmer "Time to take brain-fingerprinting seriously? A consideration of international developments in forensic brainwave analysis (FBA), in the context of the need for independent verification of FBA's scientific validity, and the potential legal implications of its use in New Zealand." (2015) 5 Te Wharenga New Zealand Criminal Law Review 316.

¹² Harrington v. State 659 N.W.2d 509 (2003).

¹³ Slaughter v. State OK CR 6 (2005).

¹⁴ Palmer, above n11, at 338.

lend to New Zealand. It concludes with a consideration of Teina Pora's case, illustrating how the P300 CIT could be used in New Zealand, and demonstrating the value of the P300 CIT.

Chapter I The P300 Concealed Information Test

A What is the P300 Concealed Information Test?

The P300 Concealed Information Test (P300 CIT) is a scientific test that can ostensibly determine whether or not a person has certain information stored within their brain by measuring the brain's response to meaningful stimuli.

When electrodes are placed on the scalp directly over the brain they detect the electrical voltage of the brain. ¹⁵ These electrical voltages are colloquially known as 'brainwaves', and can be put together to form an electroencephalogram (EEG). This method of taking recordings from the brain is a well-known and widely used technique. ¹⁶ An EEG is plotted and observed on a graph, giving a representation of the electrical activity in the brain. When certain brain regions are activated, the EEG forms a recognisable pattern, which is called an event-related potential (ERP). ¹⁷ The P300 is an ERP that is activated when a stimulus is presented that matches information that the subject has stored in their brain. ¹⁸

The P300 CIT has been garnering interest in the legal field for some time now, because of its potential for use in criminal investigations, and as evidence in court. This dissertation will focus on its use in the criminal context, because that is where the focus has been thus far.¹⁹ Criminal cases tend to provide very obvious stimuli that can be used in the test (for example, a murder weapon). The method for using the P300 CIT in the field follows a straightforward procedure. The suspect sits facing a computer screen, and electrodes are placed on their head. Stimuli are presented in the form of photos, words and pictures on the computer screen. As they are presented, the suspect's EEG is plotted on a graph, an example of which is provided in the figure below. If the subject's brain emits a P300 ERP in response to a crime-related

¹⁵ JP Rosenfeld "Brain fingerprinting: a critical analysis." (2005) 4 Sci Rev Mental Health Practice 20 at 21.

¹⁶ JW Britton, LC Frey and J Hopp *Electroencephalography (EEG): An Introductory Text and Atlas of Normal and Abnormal Findings in Adults, Children, and Infants* (1st ed, American Epilepsy Society, Chicago, 2016).

¹⁷ Rosenfeld, above n 15, at 21.

¹⁸ At 21

¹⁹ Lawrence Farwell "Farwell Brain Fingerprinting: A New Paradigm in Criminal Justice and Counterterrorism" (2013) <www.larryfarwell.com>; Rosenfeld, above n 15.

stimulus, the tester can infer that the accused has prior knowledge of that stimulus, which can provide evidence for an association between the suspect and the crime.

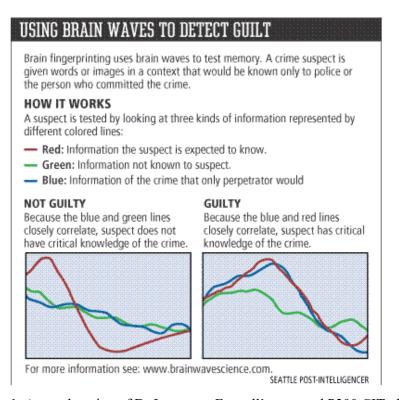


Figure 1. An explanation of Dr Lawrence Farwell's patented P300 CIT, the Brain Fingerprinting test. Figure reproduced from "Seattle Post-Intelligencer on Farwell Brain Fingerprintng [sic]" www.larryfarwell.com.

B Dr Lawrence Farwell's 'Brain Fingerprinting' Test

This dissertation will refer to Dr Farwell's 'Brain Fingerprinting' test (BF test) as a specific example of a P300 CIT that could be used in the legal context. At present, Farwell's BF test is the only one commercially available, and it has been used in several criminal cases in the United States.²⁰ Farwell's BF test is based on the technology explained above, with the key difference being the inclusion of the Memory and Encoding Related Multifaceted Electroencephalographic Response (the MERMER). Farwell claims that the P300 is part of a larger brainwave response, which he has named the P300-MERMER. He claims that use of the P300-MERMER improves the accuracy of the results obtained by a P300 CIT, and that since his discovery of the P300-MERMER, 100% of the determinations made by the BF test have

²⁰ Lawrence Farwell "Farwell Brain Fingerprinting Executive Summary" (2013) Larry Farwell www.larryfarwell.com.

been accurate.²¹ Farwell's work, and the various reactions to it, is explored in more detail in chapter II.

For clarity, Farwell's BF test is a patented P300 CIT including the P300-MERMER, and it will be referred to as the BF test throughout this dissertation. The term P300 CIT will be used to refer to the more general method of testing described above. General P300 CITs have been carried out by other scientists. They rely solely on the P300 ERP and exclude the MERMER.

C Current Use of the P300 Concealed Information Test

The P300 CIT has not yet been admitted as evidence in a criminal trial. That is not to say that it has played no role in the criminal justice system. There are a string of American cases that have included some reference to BF tests,²² and three cases where the admissibility of BF test results has been directly considered: *Harrington*,²³ *Slaughter*²⁴ and *Grinder*.²⁵

1. Harrington

Harrington was convicted of first-degree murder at the age of 17.²⁶ His repeated applications for post-conviction relief were denied until 2003, when he appealed the decision denying his application for postconviction relief on the basis of two new factors. The first was police investigative reports which stated that the State's primary witness had recanted his testimony and implicated another suspect. Farwell claims that this happened after he was "confronted" with Harrington's BF test results.²⁷ The second was the BF test results Harrington had recently obtained through testing done by Farwell.

²¹ Lawrence Farwell "Farwell Brain Fingerprinting Executive Summary" (2013) Larry Farwell www.larryfarwell.com>.

²² Lebron v Sanders U.S. Dist. LEXIS 35588 (2005); State v Bates N.J Super. Unpub. LEXIS 2335 (2007); Johnson v State Iowa App. LEXIS 222 (2007); People v Dorris IL App (4th) 120699-U (2013); Odom v State WL 4764908 (2017).

²³ Harrington v State 659 N.W.2d 509 (2003).

²⁴ Slaughter v State OK CR 6 (2005).

²⁵ Robin Palmer "Time to take brain-fingerprinting seriously? A consideration of international developments in forensic brainwave analysis (FBA), in the context of the need for independent verification of FBA's scientific validity, and the potential legal implications of its use in New Zealand." (2015) 5 Te Wharenga New Zealand Criminal Law Review 316 at 338.

²⁶ State v Harrington 284 N.W.2d 244 (1979).

²⁷ Lawrence Farwell "Farwell Brain Fingerprinting Ruled Admissible in Court" (2013) Larry Farwell www.larryfarwell.com.

To carry out the testing, the investigator must first choose what stimuli to present. These can be words or pictures. They must not be details that are publicly available, as that could give a false positive result. The suspect wears a headband containing the EEG sensors which measure the electrical activity of their brain while they are presented with the stimuli.²⁸ A computer programme then analyses the data to determine whether the P300 brainwave is present.²⁹

Farwell performed two tests on Harrington: one to test whether crime-relevant details would elicit a P300-MERMER from Harrington's brain, and one to test whether facts about Harrington's alibi would elicit a P300-MERMER. Farwell did not disclose the stimuli he used. He stated that Harrington's brain did not produce a P300 response to the crime-relevant stimuli, suggesting that his brain did not contain information about the murder. Conversely, the test suggested that he had stored information consistent with his alibi. Following presentation of these results and the police investigative reports, the Court vacated Harrington's conviction and sentence, and granted him a new trial. The State decided not to re-prosecute.

2. Slaughter

Jimmie Ray Slaughter was on death row after being convicted for the murder of his partner and young daughter.³⁰ His third appeal for postconviction relief was based on new evidence he had obtained, including a BF test administered by Farwell. Farwell stated that the test indicated that Slaughter had no knowledge of the specific details of the crime that it was assumed the perpetrator would have. The Oklahoma Court of Appeal denied the application, and declined to order an evidentiary hearing, on the basis that Slaughter had failed to actually provide any of the evidence that he said he had. Slaughter was later executed.

3. Grinder

Grinder was the primary suspect in a case of rape, assault and murder. There was insufficient evidence to charge him, so the case was not taken to trial. It is unclear why Grinder agreed to take a BF test, but he did. The BF test was performed by Farwell 15 years after the murder took place. Like any other P300 CIT, the details that were presented to Grinder could not be public

²⁸ Above n 21.

²⁹ Above n 21.

³⁰ Slaughter v State, above n 24.

knowledge. This presented some difficulty in this case due to the time that had elapsed since the crime was committed. Farwell chose to present the murder weapon, how the victim was killed, the injuries that were inflicted before her death, what the perpetrator used to bind her hands, the location of the body, items that were left at the scene and items that were stolen from the victim.³¹ If Grinder was not involved, these details should not elicit a response. Farwell found that Grinder's brain contained these details with a statistical confidence of 99.9%.³² This was corroborated by other evidence, and Grinder pled guilty in return for a life sentence without parole.

These three cases illustrate the current use of the P300 CIT in the United States. Although it was admitted as evidence by the Iowa District Court in *Harrington*, it still has not been accepted as evidence to be put before a fact-finder. Instead, it has been used to support plea deals or other evidence (for example, to confront the primary witness in *Harrington*), or to direct investigative efforts, as in *Grinder*.

D What Role could the P300 Concealed Information Test Play in New Zealand?

This dissertation aims to answer the question of whether the P300 CIT could be admissible as evidence in a New Zealand court, and who might choose to use it. However, *Harrington* and *Grinder* show that the P300 CIT may have a place in the legal system before it is admissible as evidence, in pre-trial investigations and bargaining. It is most likely to be used by the defence in these scenarios, as it has the potential for an innocent person to use it to exonerate themselves, as demonstrated in *Harrington*. The problem that the prosecution would face is that it would be practically difficult to conduct a P300 CIT on an unwilling participant, and it is unlikely that a person who believes the test will indicate that they are guilty would be willing to participate. That said, this did happen in *Grinder*, so perhaps such a use is not totally incomprehensible. This is discussed in detail in chapter V.

Given that Farwell carries out his work in the United States of America, it should come as no surprise that the United States government has already shown an interest in this body of

³¹ Lawrence Farwell "Farwell Brain Fingrprinting [sic] Catches a Serial Killer" (2013) Larry Farwell www.larryfarwell.com.

³² Palmer, above n 25, at 338.

research.³³ The US Government Accountability Office put together a report in 2001 outlining their concerns with the technology, and where they thought it could be used.³⁴ This report highlighted counter-terrorism as a key area where the P300 CIT could play a valuable role, and this idea is picked up by Farwell on his website. He states that BF tests have proven themselves "extremely accurate" at identifying individuals with knowledge which is characteristic of an explosives expert.³⁵ However, there are no reports of BF testing being used in this manner outside of the laboratory, perhaps because of issues regarding the practical difficulties of performing tests on unwilling participants. It is also interesting to note that both the CIA and the United States Navy have sponsored Farwell's tests.³⁶ This support suggests that the United States government sees a future for this technology.

Overall, it is likely that in New Zealand, the P300 CIT would provide the most value to innocent people wishing to provide some evidence of their innocence, whether it be at the pre-trial stage, or as evidence to put before a fact-finder. New Zealand law subscribes to Blackstone's Ratio: better that 10 guilty individuals go free than one innocent goes to jail.³⁷ A person should be offered every chance to prove their innocence, and if the P300 CIT does indeed assist, it would be unconscionable to deny those people access to evidence that may assist a jury to infer innocence.

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³³ "Investigative Techniques: Federal Agency Views on the Potential Application of 'Brain Fingerprinting': GAO-02-22" Op. GAO. GAO-02-22 (31 October 2001).

³⁴ Above n 33.

³⁵ Lawrence Farwell "Farwell Brain Fingerprinting Executive Summary" (2013) Larry Farwell www.larryfarwell.com>.

³⁶ Lawrence Farwell, Drew Richardson, Graham Richardson and John Furedy "Brain fingerprinting classification concealed information test detects US Navy military medical information with P300" (2014) 8 Frontiers in Neuroscience 410; Lawrence Farwell "Farwell Brain Fingerprinting Executive Summary" (2013) Larry Farwell www.larryfarwell.com

³⁷ William Blackstone *Commentaries on the Laws of England* (2nd edition, Collins & Hannay, Philadelphia, 1830) at 358.

Chapter II Questions of Validity

A The Relationship Between Legal Validity and Scientific Validity

The relationship between scientific and legal validity is not straightforward. There must be some interaction between the two fields, but it is overly simplistic to state that a certain technology must be scientifically perfect before it can enter the legal field, or that it will enter the legal field automatically upon obtaining some scientific standard. The legal field does, and should, have its own standards that may be informed by the relevant scientific standards, but should not be overridden by them.

That said, the technique must demonstrate some scientific validity. Science is an ever-changing topic, and things that were widely accepted yesterday are considered 'junk science' today – take phrenology for example.³⁸ Once regarded as a reliable predictor of mental and behavioural traits, it has now been totally discredited.³⁹ This is the danger that has to be accounted for when considering whether to accept new technologies into the law.

1. Legal tests of validity

The consideration of the relationship between scientific and legal validity begins with the United States case of *Frye*. *Frye* imposed a 'general acceptance' standard, stating that the technique should attain general acceptance among scientists in its field before it can be used in the law. ⁴⁰ This is no longer the ultimate standard, but is kept alive as one of the principles established in *Daubert*, another United States case which has been adopted in NZ law. ⁴¹ *Daubert* is discussed in the American Report to the President on Forensic Science in Criminal Courts: *Ensuring Scientific Validity of Feature-Comparison Methods* (the P-CAST Report), which considers the relationship between scientific and legal validity, and the scientific validity standards a technique will have to reach to be admissible in court. ⁴² The P-CAST Report states

³⁸ Pierre Schlag "Law and Phrenology" (1997) 110 Harvard Law Review 887 at 886.

³⁹ At 886.

⁴⁰ Frye v United States 293 F. 1013 (1923).

⁴¹ Daubert v Merrell Dow Pharmaceuticals 509 US 579 (1993).

⁴² "Report to the President on Forensic Science in Criminal Courts: Ensuring Scientific Validity of Feature-Comparison Methods" OP. EOP. (September 2016) ('the P-CAST Report').

that the technique will have to meet both foundational and applied validity criteria.⁴³ Foundational validity refers to the test itself. The method should be "repeatable, reproducible and accurate", and this basis should be founded in empirical studies.⁴⁴ In principle, this ensures that the novel scientific evidence has been obtained through a valid method and has a valid foundation. Applied validity refers to the test in practice. The method, which should by this point be reliable in laboratory studies, should also have been reliably applied in the field.⁴⁵ The P-CAST Report also states that an expert should have reliably applied the method to the current facts.⁴⁶

Professor Robin Palmer claims that the validity criteria set out in the P-CAST Report should be met before P300 CIT results can be admissible in New Zealand.⁴⁷ The P-CAST Report therefore creates a backdrop against which scientific validity can be assessed in conjunction with legal validity. The P300 CIT may not have to reach a standard of 'general acceptance', but it should produce reliable results, and have been tested successfully beyond a purely laboratory context.

B Questions of Scientific Validity

1. Arguments against scientific validity

Using the EEG as a method of gathering data from the brain and the P300 brainwave as an indicator of concealed information are both accepted by the majority of the neuroscientific community.⁴⁸ However, Farwell's BF tests are controversial in the general scientific community.⁴⁹ His method is based on the idea that the perpetrator of a crime will have the details of that crime stored in their brain; an innocent person will not. He claims that: ⁵⁰

⁴³ The P-CAST Report, above n 42, at 4–5. ⁴⁴ At 4.

⁴⁵ At 5.

⁴⁶ At 5.

⁴⁷ Palmer, above n 25.

⁴⁸ Rosenfeld, above n 15.

⁴⁹ Ewout H Meijer, Gershon Ben-Shakhar, Bruno Verschuere and Emanuel Donchin "A comment on Farwell (2012): brain fingerprinting: a comprehensive tutorial review of detection of concealed information with event-related brain potentials" (2013) 7 Cognitive Neurodynamics 155.

Lawrence Farwell "Farwell Brain Fingerprinting Executive Summary" (2013) Larry Farwell www.larryfarwell.com.

"... the brain is always there, planning, executing, and recording the crime. The fundamental difference between a perpetrator and a[n] ... innocent person is that the perpetrator ... has the details of the crime stored in his brain, and the innocent suspect does not."

However, Dr Rosenfeld, a respected neuroscientist in this field, picks out two problematic implications with the assumption that Farwell bases his BF test on:

- 1. Perpetrators are always planning their crimes; and
- 2. The brain is constantly storing an undistorted, detailed representation of experience.

Rosenfeld states that these assumptions lack evidentiary basis. He disagrees with Farwell's statement that the brain is always planning the crime, but does not provide any explanation as to how this might affect a BF test. It is true that not all crimes are planned, but it is unclear why planning is a relevant factor. Rosenfeld implies that a greater degree of planning results in memory that is easier to retrieve.⁵¹ It is true that rehearsal improves memory retrieval, but there is no literature to support the proposition that an easily retrievable memory will result in a better BF test.⁵² Rehearsed or not, the action will still create a memory. It seems that without more research, this implication will not present as much of an issue as Rosenfeld claims.

The second implication is the more relevant one. Farwell claims that his test "gets out the truth".⁵³ This may be a dramatisation to make his scientific test more palatable for the public consumption, but the human brain simply does not work that way.

(a) The unknown effects of variables on the P300 CIT

The common understanding of memory is based on the camera heuristic, which compares human memory to the image captured by a camera, and results in over-valuation of memory as a reliable tool.⁵⁴ The camera heuristic, and the use of memory in the courtroom, relies on the

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⁵¹ Rosenfeld, above n 15, at 24.

⁵² Veronica J Dark and Geoffrey R Loftus "The role of rehearsal in long-term memory performance" (1976) 15 Journal of Verbal Learning and Learning Behaviour 479.

⁵³ Beth Dalbey "Farwell's Brain Fingerprinting traps serial killer in Missouri" (17 August 1999) Cut Bank Pioneer Press <www.cutbankpioneerpress.com>.

⁵⁴ Jennifer Bard, ""Ah Yes, I Remember It Well": Why the Inherent Unreliability of Human Memory Makes Brain Imaging Technology a Poor Measure of Truth-Telling in the Courtroom" (2016) 94 Oregon Law Review 295.

idea that when two conflicting memories exist, only one of them can be the objective truth.⁵⁵ In fact, an accurate memory will only reflect the subjective understanding of an individual. It is therefore incorrect to say that a P300 CIT can reveal the truth. All it can do is suggest whether the test subject has prior knowledge of the stimulus that they have been shown.

This problem of subjective memory ties into another issue: that P300 CIT results could be attributed disproportionate weight by the jury. The reasoning is straightforward: if a person's memory is correct, and the P300 CIT reveals that memory, the jury is likely to infer that that memory must be the truth. This creates fears that a jury will over-value neuroscientific evidence, such as P300 CIT results, instead of critically assessing them in conjunction with the other available evidence.⁵⁶ This issue is discussed in detail in chapter IV.

Jennifer Bard argues that without a better understanding of how the human brain makes and stores memory, it would be a mistake to introduce this technology into the courtroom.⁵⁷ This argument can be rebutted by applying a standard of comparative advantage.⁵⁸ This standard supports the argument that memory is already used in the courtroom, and that is unlikely to change, so the reliability of the P300 CIT should be compared with the reliability of our existing memory-based methods, instead of the reliability of memory as a whole. This comparative advantage standard is discussed in detail in chapter IV.

Another common criticism levelled at BF tests is that they are vulnerable to counter-measures,⁵⁹ which is an action taken by the subject to produce an erroneous result.⁶⁰ An example of this is a rehearsed alibi. Both recalled and rehearsed alibis will evoke the same P300-MERMER, meaning that the BF test cannot identify the true alibi.⁶¹ The Rosenfeld Lab has found that overall, it is possible to 'beat' a BF test.⁶² However, further research has found

⁵⁵ Above n 54.

⁵⁶ Laura Klaming "Does Neuroscientific Evidence Bias Legal Decision-Making? Some Preliminary Findings" (2011) 3 Law, Innovation and Technology 303.

⁵⁷ Bard, above n 54, at 303.

⁵⁸ John Danaher "The comparative advantages of brain-based lie detection: the P300 concealed information test and pre-trial bargaining" (2015) 19(1) The International Journal of Evidence & Proof 52.

⁵⁹ Rosenfeld, above n 15, at 32.

⁶⁰ Rosenfeld, above n 15, at 33.

⁶¹ J Peter Rosenfeld , Matthew Soskins, Gregory Bosh and Andrew Ryan "Simple, effective countermeasures to P300-based tests of detection of concealed information" (2004) 41 Psychophysiology 205.

⁶² Rosenfeld, above n 15.

that if the method of the P300 CIT is adjusted, the countermeasures that Rosenfeld identifies are no longer effective.⁶³

Finally, the details and exact definition of Farwell's P300-MERMER remain unclear. He refuses to divulge these, claiming that it is commercially sensitive information. A more cynical view is that it does not do what he says it does. Either way, refusing to divulge the details makes it difficult to conduct in depth scientific experimentation on the MERMER, which affects whether it will be transferrable into the legal system.

2. Arguments in favour of scientific validity

The use of the P300 CIT in criminal contexts is controversial. The suggestion that our own thoughts could be obtained and used as evidence tends to evoke a visceral reaction in people, because, as Broussard J states, "if there is a quintessential zone of human privacy it is the mind".64 However, this technology does have positive aspects.

The strongest argument in favour of the P300 CIT's scientific validity is its accuracy rate. Even the Rosenfeld Lab, which tends to be sceptical of Farwell's claims, has obtained remarkably high accuracy rates when testing the P300 CIT: the lowest accuracy rate has been 80%.65 It is important to note that when these accuracy rates drop, they tend to produce false negatives rather than false positives, meaning that the test is more likely to incorrectly find someone innocent rather than guilty. 66 This is always the preferred mistake within the legal system – remember Blackstone's Ratio, which directs the legal system to err on the side of innocence.

Another factor supporting the scientific validity of the P300 CIT is the fact that it does not purport to detect guilt, anxiety or deception. Those are all subjective factors that are difficult to assess in a controlled laboratory study. Instead, it detects the simple presence or absence of information, which may be used to infer the presence or absence of knowledge. This increases scientific validity, because it provides objective data, thus giving a clearer answer.

⁶³ Daniel V Meegan "Neuroimaging Techniques for Memory Detection: Scientific, Ethical and Legal Issues" (2008) 8 American Journal of Bioethics 9.

⁶⁴ Long Beach City Emps. Association v City of Long Beach 719 P.2d 660 (1986) at [944], per Broussard J.

⁶⁵ Rosenfeld, above n 15.

⁶⁶ Rosenfeld, above n 15.

Finally, the P300 CIT appears to fulfil the *Daubert* criteria.⁶⁷ These criteria are likely to be relevant when determining whether P300 CIT results should be admissible in New Zealand.⁶⁸ These four criteria, and how the P300 CIT fares under them, are as follows.

- a. Testability. The technique must be able to be tested, and tests should have been carried out. The accuracy of the P300 CIT can be assessed by testing an individual for whom the truth of what they have done is already known. Numerous studies of such tests have been carried out, and its basic reliability has been repeatedly tested.⁶⁹
- b. Peer review and publication. Subjecting a new technique to peer review and publication theoretically unearths any substantive flaws in the methodology. The P300 CIT has undergone substantial peer review; the deficit again lies specifically with BF testing, which has not undergone such review.⁷⁰ It is notable, however, that the court in *Harrington* recognised this, and went on to accept the BF test results as part of a sufficient basis for a retrial.⁷¹
- c. Rate of error. *Daubert* recognises that different contexts will allow for different error rates. In the criminal context, P300 CIT results would be a highly prejudicial piece of evidence, and thus a high accuracy rate is likely to be required.⁷² The P300 CIT has achieved remarkably high accuracy rates:⁷³ even typically sceptical research teams have achieved 80% accuracy rates in their studies.⁷⁴
- d. General acceptance. The technique must be generally accepted by scientists in its field. Again there is something of a dichotomy between P300 CITs in general, and Farwell's

⁶⁷ Daubert v Merrell Dow Pharmaceuticals, above n 41.

⁶⁸ *Lundy v R* [2018] NZCA 410 at [237]; Palmer, above n 25.

⁶⁹ John B Meixner "Liar Liar Jury's the Trier?: The Future of Neuroscience-Based Credibility Assessment in the Court" (2012) 106 Nw. U. L. Rev 1451.

⁷⁰ Ewout H Meijer, Gershon Ben-Shakhar, Bruno Verschuere and Emanuel Donchin "A comment on Farwell (2012): brain fingerprinting: a comprehensive tutorial review of detection of concealed information with event-related brain potentials" (2013) 7 Cognitive Neurodynamics 155; Emanuel Donchin "Surprise!... Surprise? " (1981)18 Psychophysiology 493; Lawrence Farwell "Brain fingerprinting: a comprehensive tutorial review of detection of concealed information with event-related brain potentials" (2012) 6 Cognitive Neurodynamics 115; Rosenfeld, above n 15.

⁷¹ *Harrington v State*, above n 23.

⁷² Meixner, above n 69.

⁷³ Farwell "Brain fingerprinting: a comprehensive tutorial review of detection of concealed information with event-related brain potentials", above n 70; Rosenfeld, above n 15.

⁷⁴ Meixner, above n 69.

BF tests. The use of P300 ERPs in detecting concealed information is well accepted;⁷⁵ Farwell's P300-MERMER is not.⁷⁶

C Hurdles to Admissibility

1. Opposition based on its own merits

The P300 CIT is likely to meet the *Daubert* criteria, but they still highlight some shortcomings that the test will have to overcome for its admissibility to be a realistic possibility. The points that are most likely to cause issues for the P300 CIT are this lack of testing in the field, and the fact that the MERMER itself remains something of an enigma. It has been repeatedly tested, but testing has been done almost exclusively in the laboratory. The result is that it may be held to have not reached an acceptable standard of validity yet.

The issue with transferability into the 'real world' is likely to be relevant under the testability and rate of error criterion. Realistically, the only way that the P300 CIT can surpass these hurdles and gain credibility is to transfer the testing into the field. A University of Canterbury research team led by Robin Palmer has done just that. They have already performed two experiments on student volunteers and sentenced prisoners.⁷⁷ This year, with support from the New Zealand Police, they intend to start a pilot programme that will involve testing actual suspects.⁷⁸ This would constitute the first real world field tests of Farwell's technique. Field testing will almost inevitably raise issues, but this is not a problem unique to the P300 CIT. There comes a point in every new technology's timeline where it is tested in the field for the first time. While the technology may be novel, the issue of transferability is not.

The second hurdle is the secrecy that Farwell surrounds his MERMER with. This creates problems under both the peer review/publication and general acceptance criterion. Here the issue devolves from a scientific or legal argument to a personal one: Farwell is not held in high

⁷⁵ William G Iacono "The Forensic Application of "Brain Fingerprinting: Why Scientists Should Encourage the Use of P300 Memory Detection Methods" (2008) 8 American Journal of Bioethics 30; Meegan, above n 63; Rosenfeld, above n 15.

⁷⁶ Meijer, Ben-Shakhar, Verschuere and Donchin, above n 70; Rosenfeld, above n 15.

⁷⁷ UC Communications "Brainwave activity that reveals knowledge of a crime" (16 January 2020) University of Canterbury <www.canterbury.ac.nz/news/2020>.

⁷⁸ Above n 77.

regard in his field. Neuroscientists tend to take issue with Farwell's relationship with American government organisations and the fact that he will not disclose the science behind his P300-MERMER. They assert that Farwell's test is less reliable than he claims. However, Farwell's BF test is not the only option available. Research shows that the MERMER does not have to be incorporated into the test to obtain high accuracy rates, and other scientists have already developed their own P300 CITs – for example, Rosenfeld has developed another P300 CIT that he claims is accurate and resistant to countermeasures. It is therefore reasonable to predict that this issue will not provide a significant hurdle in the medium to long term.

2. Opposition based on previous technologies: the lasting effect of the Control Question Test

The P300 CIT is often wrongly equated to the discredited Control Question Test (CQT – the standard lie detection test), which causes people to dismiss the P300 CIT before considering it on its own merits.

Analogising the P300 CIT to the CQT is not only inaccurate, it creates a hurdle in terms of the public perception of the P300 CIT. The CQT has gained fame through pop culture, and notoriety through being unfortunately easy to fool. It works by detecting and measuring the examinee's physiological responses as they answer a series of questions.⁸¹ The three most common physiological responses measured are changes in respiration, electrodermal activity, and blood pressure.⁸² Changes in these three factors are known to be associated with the sympathetic nervous system, and thus should occur when the examinee is put under stress.⁸³ The validity of the CQT has been subject to debate since the 1970s, and the general consensus today is that it lacks scientific validity.⁸⁴ A relationship cannot be drawn between deception and the physiological responses that the CQT measures.⁸⁵ Further, a person can train

⁷⁹ Rosenfeld, above n 15.

⁸⁰ JP Rosenfeld, E Labkovsky, M Winograd, M Lui, C Vandenboom and E Chedid "The Complex Trial Protocol (CTP): A new, countermeasure-resistant, accurate P300-based method for detection of concealed information" (2008) 45 Psychophysiology 906.

⁸¹ Gershon Ben-Shakhar "A critical review of the Control Questions Test (CQT)" Handbook of polygraph testing 103 at 104.

⁸² At 104.

⁸³ Rudolf Hoehn-Saric and Daniel R McLeod "The Peripheral Sympathetic Nervous System: Its Role in Normal and Pathologic Anxiety" (1988) 11(1) Psychiatric Clinics of North America 375.

⁸⁴ John J Furedy and Ronald J Helsegrave "Validity of the Lie Detector: A Psychophysiological Perspective" (1988) 15(2) Criminal Justice and Behavior 219 at 243.

⁸⁵ Ben-Shakhar, above n 81, at 106.

themselves to modulate their physiological responses relatively easily, making it easy to fool the CQT.⁸⁶

Why is this an issue? As already made clear, the P300 CIT is *not* the same as the CQT. Its results are based on different measures, and it does not purport to detect deception, which is the most controversial aspect of the CQT. The problem is that to the untrained eye, the tests are easy to compare, and our judges and juries do not tend to be scientifically trained. This exercise in analogy essentially traps judicial thinking, and leads to a neglect in considering the current issue in more depth.⁸⁷ It could also result in lawyers failing to impose adequate scrutiny of evidence. It is a lot easier to draw on what we already know to understand the P300 CIT, but insisting on using these comparisons will create inappropriate barriers for the P300 CIT. Although this test can fit into existing categories in many aspects, this is one place where a line must be drawn between the P300 CIT and other technologies. Its potential admissibility must be considered based on its own merits rather than the merit of a discredited technology.

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⁸⁶ C R Honts, D C Raskin, J C Kircher and R L Hodes "Effects of Spontaneous Countermeasures on the Physiological Detection of Deception" (1988) 16 Journal of Police Science and Administration 91; C R Honts, R L Hodes and D C Raskin "Effects of Physical Countermeasures on the Physiological Detection of Deception" (1985) 70 Journal of Applied Psychology 177.

⁸⁷ Alexandra Roberts "Everything New is Old Again: Brain Fingerprinting and Evidentiary Analogy" (2006) 9 Yale Journal of Law and Technology 234.

Chapter III The New Zealand Approach to Novel Scientific Evidence

A The Basis of the New Zealand Approach

The New Zealand approach to novel scientific evidence is governed by s 25 of the Evidence Act 2006. How the Evidence Act relates to the P300 CIT will be discussed under heading C, but it is likely to be sufficient to solely govern the admissibility of the P300 CIT. First, the history and evolution of the tests will be explored.

The root of legal tests for novel scientific evidence in New Zealand can be found in United States case law, in *Frye v United States*. ⁸⁸ *Frye* was decided in the District of Columbia Court of Appeals, and has spawned a long-lasting legacy that has influenced tests of novel scientific evidence around the globe, including in New Zealand. *Frye* considered whether an expert witness could testify to the results of a systolic blood pressure test. The test was based on experiments which claimed that conscious deception or falsehood would induce fear, thus raising the defendant's blood pressure. ⁸⁹ The Court decided that such evidence was inadmissible, and the original criteria for admissibility of expert scientific testimony was born. *Frye* states that the scientific evidence must have gained 'general acceptance' in the particular field to which it belongs for the evidence to be admissible. ⁹⁰ Although this general acceptance test has fallen by the wayside now, the concept underpinning it remains a consideration often taken into account by the law.

The enduring modification to the admissibility test for novel scientific evidence came with *Daubert v Merrell Dow Pharmaceuticals*, which was decided by the United States Supreme Court. This case established the test that remains in place in the United States today, and it too has had a significant influence in New Zealand's approach to the admissibility of novel scientific evidence. *Daubert* held that the *Frye* test was superseded by the Federal Rules of Evidence, and was no longer applicable. The strict requirement of 'general acceptance' was held to limit the liberal thrust of the Rules, meaning that *Frye* could no longer stand. *Daubert*

⁸⁸ Frye v United States, above n 40.

⁸⁹ At 1013.

⁹⁰ At 1014.

⁹¹ Daubert v Merrell Dow Pharmaceuticals, above n 41.

outlines four non-exclusive factors that a court should consider when determining whether novel scientific evidence is sufficiently reliable. These are as follows:

- 1. Can the theory or technique be tested? Has it been?
- 2. Has the theory or technique been subject to robust peer review?
- 3. What is the known or potential error rate of the technique?
- 4. Is the technique generally accepted in its field?

The fourth factor shows that although the Supreme Court purported to remove the Frye test, its essential component remains relevant. The Daubert principles have been applied consistently in later US cases, including in Harrington, a case described in chapter I that considered the admissibility of a P300 CIT result. 92 Daubert stresses that the judge must perform a gatekeeping role. Their role is to assess reliability and helpfulness to determine the technique's admissibility into the proceeding, and not to resolve scientific disputes.⁹³

В The Evidence Act 2006 and the P300 CIT

All evidence must pass the ss 7 and 8 tests of the Evidence Act to be admissible. Section 7 states that evidence must be relevant: it must have the tendency to prove or disprove anything that is of consequence to the determination of the hearing.94 Section 8 states that the Judge must exclude the evidence if its probative value is outweighed by the risk that the evidence will have an unfairly prejudicial effect on the proceeding, or needlessly prolong the proceeding.⁹⁵ Like any other evidence, P300 CIT results would have to pass these tests to be admissible in court.

Under the Evidence Act, different types of evidence are subjected to different rules. The categorisation of the P300 CIT could therefore affect whether or not it could be admissible in court. The P300 CIT is likely to be classified as novel scientific evidence, thus bringing it under the umbrella of expert opinion evidence, which is covered by section 25 of the Act. The reasoning behind this is straightforward: the P300 CIT has to be administered by an expert, and

⁹² Harrington v State, above n 23.

⁹³ Matthew Downs (ed) Cross on Evidence (online loose-leaf ed, LexisNexis) at [25.7].

⁹⁴ Evidence Act 2006, s 7.

⁹⁵ Section 8.

the results can only be interpreted by an expert. To present the results of the test in court would therefore require an expert witness, who would present both facts (the actual P300 CIT results) and their own opinion (what the P300 CIT result suggests). Expert opinion evidence is subject to a 'heightened relevance' test – it must be likely to be substantially helpful in assisting the fact-finder to understand other evidence presented in the proceeding, or to ascertain a fact that is of consequence to the determination of the proceeding.⁹⁶

What will constitute 'substantially helpful' evidence? In a pre-trial appeal of *Lundy*, the Court of Appeal stated, with reference to *Daubert*, that one purpose of this increased helpfulness test is to protect the jury from "unsatisfactory theories", which they contrasted with evidence that is from a reputable source and has been robustly researched and analysed. To meet the heightened substantial helpfulness test, the Court of Appeal stated that the "complications in the science [must] have been resolved, the techniques [must be] broadly accepted and the probative value of their application [must be] agreed in the scientific community." If the *Daubert* principles are met, then those three requirements will be fulfilled. The P300 CIT is likely to fulfil the *Daubert* criteria, suggesting that it could also pass the s 25 substantial helpfulness test, and could be admissible under the Evidence Act.

C The Current New Zealand Approach

The Court of Appeal in *Lundy* referred to *Daubert* as a "useful template" for determining the admissibility of novel scientific evidence,⁹⁹ and held that "what is required is a track record of acceptance by a body of scientific opinion", which will be demonstrated when the evidence is analysed in accordance with the *Daubert* principles.¹⁰⁰ Robin Palmer describes the *Daubert* principles as a criteria that the court can use when assessing whether a novel scientific technique would be "substantially helpful"¹⁰¹ in accordance with the Evidence Act criteria for admissibility.¹⁰²

⁹⁶ Section 25(1).

 $^{^{97}}$ Lundy v R [2014] NZCA 576 [pre-trial appeal] at [72] [Lundy D]. Note: this dissertation references six Lundy cases. For ease of reference, these will be given the reference tags Lundy A - F, in chronological order.

⁹⁸ Lundy v R [2018] NZCA 410 at [242] [Lundy E].

⁹⁹ At [237].

¹⁰⁰ At [241].

Wording taken from the 'substantial helpfulness' test for novel scientific evidence described in the Evidence Act, s 25(1).

¹⁰² Palmer, above n 25.

There has not yet been an attempt to get P300 CIT results admitted as evidence in a New Zealand court, but the courts have considered other novel scientific evidence. While I have argued that the P300 CIT should be differentiated from other evidentiary scientific techniques to avoid the negative implications by analogy, it is important that the pendulum does not swing too far in the opposite direction. There lies the risk of 'techno-exceptionalism'. Treating the P300 CIT as something that requires specific law of its own unnecessarily over-complicates the issue.

Daubert was first considered in New Zealand by Tipping J in the High Court in R v Calder. 103 The defendant was Dr Vicky Calder, who was charged with the attempted murder of her expartner, Professor David Lloyd, by poisoning him with acrylamide. The evidence in contention was the result of a scientific technique which analysed Lloyd's hair for traces of CEC, a byproduct of acrylamide. 104 Tipping J held that the relevant tests for admissibility were whether the evidence was 'relevant and helpful', which is the minimum requirement of reliability that is set out in sections 7 and 8 of the Evidence Act, and applies to any evidence that is admitted in court. 105 His Honour accepted the gatekeeping role imposed by the Daubert test. Judges must assess the reliability of novel scientific evidence themselves, and cannot rely solely on the general acceptance of the technique among the researchers in its field. Tipping J added that judges should err on the side of exclusion if uncertain. 106 This note of caution speaks to an underlying awareness that often when novel scientific techniques are sought to be used, their scientific bases have not been universally agreed on, or the technique has not been proved to be 100% accurate. While this should not outright prevent the techniques from being used, it means that the courts have to be aware of the possibility that if the technique is later found to be invalid, they may well have relied on erroneous evidence to send innocent people to prison - something that, according to Blackstone's Ratio, must be avoided.

This cautionary note was picked up by the Court of Appeal in *Shepherd*, ¹⁰⁷ which involved an appeal from conviction for aggravated robbery. The appeal was based on evidence obtained by

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¹⁰³ R v Calder HC Christchurch T 154/94, 12 April 1995.

¹⁰⁴ Karen Belt "Novel Scientific Evidence and Judicial Gatekeeping: *R v Calder* and *Daubert v Merrell Dow Pharmaceuticals* Compared" (1999) 28(2) Victoria University of Wellington Law Review 399 at 399.

¹⁰⁵ Section 7 describes the admissibility test; s 8 describes the probative value balancing test.

¹⁰⁶ *R v Calder*, above n 103, at [7].

¹⁰⁷ Shepherd v R [2011] NZCA 666.

a novel facial mapping technique which had not previously been admitted in a New Zealand court. This facial mapping technique detected similarities between a photograph of the accused taken in custody, and CCTV footage of the accused at the premises that were robbed. This evidence was relied on by the Crown in the District Court, where it had been given by an expert witness in the field of facial mapping in accordance with s 25 of the Evidence Act.¹⁰⁸ This decision was endorsed by the Court of Appeal on the basis that the test results were more reliable and probative than simple eyewitness identification, and therefore it could be considered "substantially helpful".¹⁰⁹ The Court again emphasised that a cautious approach is required when assessing the admissibility of such evidence, and made it clear that trial judge should give directions to the jury regarding how they may use the evidence.¹¹⁰

Both of these cases put significant emphasis on taking a cautionary approach, but both allowed the novel scientific evidence in question to be admitted, with appropriate directions. With that background, I turn now to a more recent case dealing with the admissibility of novel scientific evidence: *Lundy v R*.¹¹¹ In 2002 Mark Lundy was convicted of murdering his wife and daughter, based in part on evidence derived from two novel scientific techniques. The techniques in question were immunohistochemistry (IHC) tests and mRNA testing done on fragments of brain tissue found on Lundy's shirt, which were found be human, and to belong to his wife.

Both the High Court and Court of Appeal held pre-trial that the evidence produced by both tests was admissible.¹¹³ Even though they were "novel methodologies" capable of producing false positive results, they were held to be sufficiently reliable to go to the jury.¹¹⁴ The results of both of these tests formed a significant part of some fairly circumstantial evidence. The evidence obtained from the mRNA testing is discussed by the Supreme Court in the 2019 appeal,¹¹⁵ and the evidence obtained from the IHC tests is discussed by the Court of Appeal in a 2018 appeal.¹¹⁶ The courts' consideration of these techniques provides some insight into how a court might consider P300 CIT results.

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¹⁰⁸ Shepherd v R, above n 107, citing Shepherd v R DC Auckland CRI-2009-044-9890, 27 September 2010.

¹⁰⁹ Shepherd v R, above n 107, at [101].

¹¹⁰ At [62] and [105] – [109].

¹¹¹ Lundy v R [2019] NZSC 152 [Lundv F].

¹¹² R v Lundy HC Palmerston North T 13-01, 12 April 2002 [Lundy A].

¹¹³ *Lundy F*, above n 111, at [18].

¹¹⁴ At [18].

¹¹⁵ *Lundy F*, above n 111.

¹¹⁶ *Lundy E*, above 98.

1. The mRNA testing

While mRNA testing itself is a widely used and generally highly accepted technique, its use in this context was not. This is because RNA is known to degrade much faster than DNA, and the ways in which it degrades are not well understood. Further, testing requires the RNA to be copied to form DNA, which then has to be amplified, thus amplifying any anomalies and significantly increasing the risk of obtaining an incorrect result. The mRNA testing was carried out by the Netherlands Forensic Institute (NFI), who have developed a method that they claim allows them to identify which cell type a mRNA sample comes from. This has not been validated for forensic use, and the technique was not widely used. It has not undergone the research and peer review required to be generally accepted by scientists in the field.

2. The IHC testing

IHC is also a widely used and accepted technique that was used in a novel manner. Nevertheless, the Court of Appeal held that the evidence was admissible when considered under the ss 7, 8 and 25 tests. ¹²¹ In subsequent appeals, an expert witness in the Privy Council case described its use in this context as "a novel approach", ¹²² and the United States Armed Forces Institute of Pathology described it as "raising questions". ¹²³ In a post-trial decision, the Court of Appeal held that admitting this evidence was a mistake. ¹²⁴ IHC was described as "potentially inconsistent and unreliable" in an affidavit given by an Associate Professor of Physiology. ¹²⁵ The same affidavit stated that the IHC tests were "inadequate to reach a reliable conclusion". ¹²⁶ Further, the circumstances surrounding this particular test were shaky at best. The tests were carried out in Texas in a lab that was not forensically accredited by a man who

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¹¹⁷ *Lundy F*, above n 111, at [55].

¹¹⁸ At [55].

¹¹⁹ At [49].

¹²⁰ At [55].

¹²¹ Lundy v R [2013] UKPC 28 [Lundv B].

¹²² At [134].

¹²³ At [137].

¹²⁴ *Lundy E*, above n 98, at [246].

¹²⁵ At [31].

¹²⁶ At [31].

was not a forensic pathologist.¹²⁷ It is unlikely that he would have been permitted to give this evidence had the trial been carried out in his home state of Texas.¹²⁸

Lundy therefore appears to be an outlier in the cases on this issue, as it seems to depart from the New Zealand courts' typically cautious approach. Further, the High Court's approach to the Daubert factors in deciding the admissibility of these techniques is one that has not been followed since. The Court held that the Daubert factors were inconclusive, did not consider total novelty and represented a liberal regime. They preferred instead to draw on the orthodox approach that existed prior to the enactment of the Evidence Act. This imposes a lower threshold than Daubert, requiring only that the opinion be given by a suitably qualified expert and sourced from a recognised area of science. The Court of Appeal's 2018 decision does not endorse this approach, and reiterates the Daubert criteria. This is consistent with the earlier warnings towards caution found in Shepherd and Calder. The P300 CIT arguably does not need its own law, but the High Court's departure from the recommended approach gives impetus to the need for guidelines in this area.

The New Zealand cases show that the courts are willing to admit novel scientific evidence, but they advocate for a cautious approach to such evidence. It is possible that the high profile nature of the mistake in *Lundy* may increase the courts' reluctance to admit novel scientific evidence, and it is important that this case is used to guide future courts in decisions regarding admissibility, rather than to justify the exclusion of novel scientific evidence. The New Zealand cases demonstrate an acceptance of the *Daubert* principles, suggesting that they will be relevant in providing the legal tests to be administered under s 25 of the Evidence Act.

¹²⁷ At [12].

¹²⁸ Texas Rules of Evidence 2015, rules 702 and 703.

¹²⁹ R v Lundy [2014] NZHC 2527 at [26] – [30] [Lundy C].

¹³⁰ At [31]

¹³¹ *Lundy E*, above n 98, at [237] – [242].

Chapter IV Exploration of 'Comparative Advantage'

A What Standard Should the P300 Concealed Information Test be Held To?

How accurate and reliable should the P300 CIT be before it can be accepted as evidence in the courtroom? One approach proposed and discussed by legal academic John Danaher is that of comparative advantage. This approach compares the technique in question to the techniques and processes that are already part of the law.¹³² It is based on the premise that a technique should enter the legal system when it is an improvement on the current techniques and processes, rather than only when it is 100% accurate. When the standard of comparative advantage is applied to the P300 CIT, it becomes apparent that a number of issues raised by the P300 CIT are not as novel as they first seem, and the law already has structures in place to address these issues.

1. Why might we apply the standard of comparative advantage?

Danaher focusses on how the use of the P300 CIT could improve pre-trial bargaining, which is one area where it is likely to be used in New Zealand.¹³³ The equivalent in New Zealand is a case review hearing.¹³⁴ Danaher argues that the P300 CIT could improve pre-trial bargaining by addressing the 'innocence problem' that is inherent in this process, and by extension in the case review hearing process.¹³⁵

(a) The innocence problem

The innocence problem was first presented by Mnookin and Kornhauser, who explain that all pre-trial bargaining takes place 'in the shadow of the law'. The assumption is that during this process, the prosecution wants to maximise the punishment; the defence wants to minimise it. Both parties want to avoid a trial, because they are expensive and unpredictable. Based on

¹³² John Danaher "The comparative advantages of brain-based lie detection: the P300 concealed information test and pre-trial bargaining" (2015) 19(1) The International Journal of Evidence & Proof 52.

¹³³ At 58.

¹³⁴ Criminal Procedure Act 2011, s 54 and 57.

¹³⁵ Danaher, above n 132, at 59.

¹³⁶ Robert H Mnookin and Lewis Kornhauser "Bargaining in the Shadow of the Law: the Case of Divorce" (1979) 88 Yale Law Review 950 at 968.

these assumptions, accepting a lesser punishment is often the preferred outcome for both parties because it maximises convictions and minimises costs for the prosecution, and minimises the expected punishment for the defendant. The result of this is that an innocent defendant may believe it is better to plead guilty to some lesser offence. This is undesirable. The innocence problem arises because although a defendant may be genuinely innocent, they have no way of proving that to the prosecution (assuming that there is no alibi), because a guilty defendant is just as likely to say that they are innocent as an innocent one is. This is where the P300 CIT becomes relevant. If it is an option available to a suspect in the case review hearing, an innocent person is more likely to agree to it than a guilty person, as they have a good chance of establishing their innocence through the use of the P300 CIT. The suspect's willingness to take the P300 CIT, and the results of that test, provides a way to credibly signal that they believe that they are innocent. It is important to note that willingness to take a P300 CIT alone is only an indication of innocence.

This use of the P300 CIT supports New Zealand's subscription to Blackstone's Ratio. The focus should be on ensuring that innocent people do not end up in prison, and that should be valued over sending a guilty person to prison. This use of the P300 CIT allows an innocent person to indicate that they believe they are innocent, and decreases the likelihood that they will have to accept a lesser sentence when they should not be sentenced at all.

(b) The right to silence

This use of the P300 CIT risks infringing the right to silence, unless the person elects to take the P300 CIT voluntarily. This is a fundamental legal principle, ¹³⁹ but concerns have been raised almost since its inception that the right to silence is being undermined by the presumption that innocence loudly proclaims itself, while guilt remains silent. ¹⁴⁰ It is important that the legal system does not interpret refusal to take a P300 CIT as a signal of guilt.

¹³⁷ Danaher, above n 132, at 59.

¹³⁸ Stephanos Bibas "Plea Bargaining Outside the Shadow of Trial" (2004) 117(8) Harvard Law Review 2464 at 2467.

¹³⁹ New Zealand Bill of Rights Act 1990, s 23(4).

¹⁴⁰ Simon Matters "Anything You Don't Say May Be Given In Evidence: Protecting the Interests of Justice or Emasculating a Fundament Right?" (1997) 4 Deakin Law Review 50 at 53; Elisabeth McDonald "Why so Silent on the Right to Silence? Missing Matters in the Review of the Evidence Act 2006" (2013) 44 VUWLR 573; Law Commission Second Review of the Evidence Act 2006 (NZLC IP42, 2018).

(c) Misunderstandings of the P300 CIT

Danaher argues that resistance to the P300 CIT comes (at least in part) from misunderstandings of the accuracy of the test. ¹⁴¹ Repeated testing by various neuroscientists shows that the P300 CIT is not 100% accurate, but it should not be expected to be. Schauer argues that even a test with 80% accuracy can be valuable in contexts where the standard of proof is lowered. Studies quantifying jury error rates have found that juries are accurate in their verdicts around 83% of the time, ¹⁴² but when a person is asked to detect deception from a single factor, accuracy drops to 52–57%. ¹⁴³ A test that reliably detects information with at least 80% accuracy, as the P300 CIT does, is therefore significantly better than a person performing the same task, which is the method currently used in the legal system. ¹⁴⁴ In this regard, the P300 CIT has reached the comparative advantage standard.

2. Arguments against adopting the standard of comparative advantage

(a) Limits of the technology: the fallibility of memory

Jennifer Bard states that without a more comprehensive understanding of memory, it would be a mistake to introduce this technology into the legal system. Human memory is unreliable. He People forget what they have witnessed, or are certain that they observed events that never took place. The P300 CIT relies on memory: the P300 brainwave appears when the presented stimulus matches a stored memory. The P300 CIT is therefore likely have the same problems as memory when asking someone to recall what they saw (or think they saw) take place. The key point is that this is not a problem unique to the P300 CIT. It is a problem pertaining to human memory, and human memory is something that is already heavily relied upon by the legal system. Further, the fallibility of human memory is a problem that has already been

¹⁴¹ Danaher, above n 132, at 58.

¹⁴² Bruce D Spencer "Estimating the Accuracy of Jury Verdicts" (2007) 4 Journal of Empirical Legal Studies 305 at 327.

¹⁴³ Paul Ekman and Maureen O'Sullivan "Who can catch a liar?" (1991) 46(9) American Psychologist 913 at 918.

¹⁴⁴ Frederick Schauer "Can Bad Science be Good Evidence? Neuroscience, Lie Detection, and Beyond" (2009) 95 Cornell L. Rev. 1191.

¹⁴⁵ Bard, above n 54.

¹⁴⁶ Mark L Howe and Lauren M Knott "The fallibility of memory in judicial processes: Lessons from the past and their modern consequences" (2015) 23(5) Memory 633 at 634.

¹⁴⁷ At 634.

¹⁴⁸ Rosenfeld, above n 15.

recognised by Parliament, and steps have been taken to try and reduce the effect of these issues: for example, the Evidence Act 2006 deals with the admissibility of identification evidence. 149

(b) Limits of the technology: mind-altering substances

This memory problem has other implications for the effectiveness of the P300 CIT. In New Zealand, 50% of offences are committed by people under the influence of drugs or alcohol. It is long established that drugs influence the formation of memories by interfering with the neurotransmitters that underlie the biological basis of memory. Unfortunately, there has not yet been any studies carried out where a P300 CIT is performed on a subject who was under the influence of drugs or alcohol at the time they committed the crime, so it is unclear how these factors would influence the results of a P300 CIT.

In summary, two ideas underly this dissertation: first, that a number of issues raised by the P300 CIT are not as novel as they first seem in that they are issues in general, and second, that the law already accepts these issues will be present in some form. The fallibility of memory creates a problem for the admissibility of the P300 CIT – but it creates the same problem for numerous other pieces of evidence. If those pieces of evidence are admissible (albeit subject to restrictions and certain procedural requirements), 152 then it seems illogical to use the same problem to bar P300 CIT results from evidence.

The P300 CIT should not be looked at as a stand-alone piece of technology, but instead in the context of other comparable evidence. It is true that the technology could still be improved, but introducing it into the law will not bar any further improvements, and even as it is, it may do a better job of recalling drug or alcohol affected memories than a human.¹⁵³

¹⁵⁰ Department of Corrections *Breaking the Cycle: Our Drug and Alcohol Strategy Through to 2020* (March 2016) at III.

¹⁴⁹ Evidence Act 2006, ss 45 and 46.

¹⁵¹ Bruce Hunter, Steven F. Zornetzer, Murray E Jarvik and James L McGaugh "Modulation of Learning and Memory: Effects of Drugs Influencing Neurotransmitters" in *Drugs, Neurotransmitters, and Behaviour* (Springer, Boston, 1977) at 531.

¹⁵² For example, visual identification evidence must be obtained through the formal procedure described in s 45(3) of the Evidence Act, or there must be good reason not to have followed the formal procedure (s 45(1)).

¹⁵³ T O Nelson, M McSpadden, K Fromme and G A Marlatt "Effects of alcohol intoxication on metamemory and on retrieval from long-term memory." (1986) 115(3) Journal of Experimental Psychology 247; compare to Kristina Suchotzki and Matthias Gamer "Alcohol facilitates detection of concealed identity information" (2018) 8 Scientific Reports 7825.

(c) Limits of the technology: jury over-valuation

Juries have historically been believed to be easily influenced by misleading scientific evidence, and inept at critically evaluating technical evidence. However, the empirical evidence on jury overvaluation does not fully support this conclusion. Seuroscientific evidence is often presented as an image, and images are known to influence the jury more than oral evidence. Searchers should therefore exclude the potentially confounding variable of image type when studying the effects of neuroscientific evidence on a jury, so that it can be properly concluded that overvaluation was an effect of the brain scans, rather than the effect of an image. Searchers have consistently failed to do this, meaning that they cannot properly conclude that the overvaluation was caused specifically by the brain scan. Instead it is possible that any image, scientific or not, could be the cause of overvaluation. Searchers have in evidence, and scientific evidence can be presented to the jury. While it may be a novel scientific technique, P300 CIT results presented as evidence will fall into existing categories that already have laws regulating them. Searchers have thus far been sufficient to address jury overvaluation, then they should be sufficient to regulate overvaluation of the P300 CIT.

Further, as stated earlier, the P300 CIT is likely to be useful before it reaches the courtroom, through the case review hearing process. There is no jury involved at this point. Those engaging with the P300 CIT results would be less susceptible to over-valuation, and would have the time to understand the test results and what they might mean for the investigation. To disallow the use of the P300 CIT based on the fact that a jury might misinterpret its results could result in its exclusion even from a judge-alone trial. Jury overvaluation is certainly something that needs to be accounted for, but it should not be enough to completely bar the P300 CIT from the legal system.

¹⁵⁴ Meixner, above n 69.

¹⁵⁵ Schauer, above n 144.

¹⁵⁶ David A. Bright and Jane Goodman-Delahunty "Gruesome Evidence and Emotion: Anger, Blame, and Jury Decision-Making" (2006) 30 Law and Human Behaviour 183 at 185.

¹⁵⁷ Schauer, above n 144, at 1211.

¹⁵⁸ At 1211.

¹⁵⁹ See chapter V for a detailed discussion. If results of a P300 CIT are presented as evidence, they will be expert opinion evidence, and thus governed by s 25 of the Evidence Act.

(d) Conclusion

At a minimum, the P300 CIT should have to provide a comparative advantage before its introduction into the law is considered. Precluding it, without consideration of the processes and technologies already present in the law, does not properly reflect our existing legal system. Research suggests that it is an improvement on some aspects of the legal system, and it arguably has already met the comparative advantage standard.

B How Our Current System Influences the Potential Incorporation of the P300 Concealed Information Test

It is a popular and enduring conception that the jury has the monopoly on assessing credibility. A concern that inevitably arises when discussing this technology is that it will take over the jury's role. Juries have been a staple of the court system for a long time: the first modern jury trial took place in 1798. It is understandable that the legal system is reluctant to change such a deeply ingrained aspect to accommodate a new technology. The answer to this concern is straightforward: the P300 CIT and the jury perform mutually exclusive roles, and they will not overstep each other's boundaries. The P300 CIT suggests whether or not information is present in a person's brain; the jury decides whether or not a certain fact is true. The P300 CIT is simply another piece of evidence that the jury can take into consideration.

Underling the concern that the P300 CIT might assume the jury's role is the suggestion that it would be less accurate than the jury. Older technologies, like the control question test, are notoriously inaccurate, and are just as easy to fool than a jury, if not easier. Combine this with the fact that people tend to think that they can tell when someone is lying purely by virtue of being human, and the result general public suspicion of any technology that claims it can fill a human role.

¹⁶⁰ William Forsyth *History of Trial by Jury* (1st ed, John W. Parker and Son, London, 1852) at 369.

¹⁶¹ Ben-Shakhar, above n 81, at 104.

¹⁶² Mark G Frank and Thomas Hugh Feeley "To Catch a Liar: Challenges for Research in Lie Detection Training" (2003) 31(1) Journal of Applied Communication Research 58.

¹⁶³ Ken Alder The Lie Detectors: The History of an American Obsession (Simon & Schuster, New York, 2007).

If jurors make more accurate assessments of credibility based on their own judgements than on expert testimony, they should be left to do that.¹⁶⁴ But if jurors are inaccurate in their assessments, then restricting expert testimonies leads to less accurate decisions. Research on the human's ability to detect lies repeatedly shows that we are not very good at it. 165 In fact, even after research subjects were given training in detecting lies, their accuracy was still only 52-57% – in other words, not much better than a random guess. ¹⁶⁶ These studies are based on demeanour rather than content, so are not entirely analogous to the cues that a jury will base their decision on, but even the most optimistic studies that are relevant to a jury suggest that individuals are still only 60% accurate in credibility assessments. 167 The jury clearly displays inadequacies at achieving their job because of their inability to objectively ascertain the truth. Restricting expert testimony such as P300 CIT results amplifies those inadequacies, and leads to less accurate verdicts, which is an undesirable outcome for the legal system as a whole. If a technology can provide more accurate assessments than a jury, then those assessments should be available for the jury to consider when assessing the veracity of a witness. I reiterate that the P300 CIT does not purport to make the jury obsolete, and this hurdle should not be a major one.

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¹⁶⁴ Meixner, above n 69.

¹⁶⁵ Timothy Levine, Hee Sun Park, and Steven McCornack "Accuracy in detecting truths and lies: documenting the 'veracity effect'" (1999) 66(2) Communications Monographs 125.

¹⁶⁶ Ekman and O'Sullivan, above n 143.

¹⁶⁷ Maria Hartwig, Pär Anders Granhag, Leif A Stromwall and Aldert Vrij "Detecting Deception Via Strategic Disclosure of Evidence" (2005) 29 Law and Human Behaviour 469 at 477.

Chapter V Matters of Legal Rights

The preceding analysis has focussed on the practical aspects of the P300 CIT, including its scientific validity, where it may sit in relation to current New Zealand legislation and the standard it may be expected to reach before it could be admitted into New Zealand law. This chapter moves on to consider how the P300 CIT would interact with the fundamental human rights that apply in New Zealand, and explore the possibility of lawfully compelling a P300 CIT.

A Rights That the P300 Concealed Information Test May Interfere With

The P300 CIT has the potential to trigger human rights issues. While these are unlikely be a problem if a person consents to taking a P300 CIT, if a P300 CIT is administered without the subject's free and informed consent, these rights will threatened. This chapter begins by identifying the legal rights that could be affected by the P300 CIT, and will explore when, if ever, it may be lawfully justifiable to compel the taking of a P300 CIT. It will conclude with a discussion of *Selvi*, in which the Indian Supreme Court considered the admissibility of the results of three scientific techniques that were performed on suspects without consent. ¹⁶⁸

1. The New Zealand Bill of Rights Act

There are four key rights under the New Zealand Bill of Rights Act 1990 (NZBoRA) that are likely to be relevant when considering the P300 CIT. The first is the right not to be subject to scientific experimentation without consent. The P300 CIT is a novel scientific technique, and thus its use is classed as experimentation, which is not permitted without the subject's free and informed consent. The second right that may be affected is the right to be presumed innocent until proven guilty. The third is the right not to be compelled to be a witness against oneself or to profess guilt. This right is supported by s 73(1) of the Evidence Act, which states that the defendant in a criminal proceeding is not a compellable witness. This will be

¹⁶⁸ Selvi and Others v State of Karnataka and Another [2010] 5 LRC 137.

¹⁶⁹ New Zealand Bill of Rights Act 1990, s 10.

¹⁷⁰ Section 25(c).

¹⁷¹ Section 25(d).

¹⁷² Evidence Act, s 73(1).

explored in detail under heading C, but in *Selvi* this right provided sufficient basis for the court to find that results of similar scientific tests attracted this protection.¹⁷³ Finally, every person has the right to be free from unreasonable search and seizure.¹⁷⁴ All of these rights will be undermined if a suspect is forced to take a P300 CIT without their consent, and if there is no lawful justification for coercion.

The caveat to these rights is section 5, which permits their reasonable limitation if it is prescribed by law and can be demonstrably justified in a free and democratic society. A possible justification is that the P300 CIT may respond to the ever present need for verdicts to be as accurate as possible by providing another piece of evidence for the fact-finder to consider. People are still falsely imprisoned in NZ, suggesting that there is a real niche for more types of evidence that would allow the exoneration of innocent people in particular. 176

2. Tort

The torts of assault and battery are also likely to be relevant if a P300 CIT is unlawfully obtained by force. Battery is the intentional application of force to another person with no lawful justification; assault is the act of causing a person to reasonably apprehend immediate battery. ¹⁷⁷ If a person has not consented to taking a P300 CIT, then it would likely meet the requirements for assault and battery, meaning that the subject could bring an action in tort.

All of the rights identified are based in the inherent dignity of the person, and the fact that New Zealand law places significant value on consent to bodily touching. These rights are unlikely to cause any issues if a person has given their free and informed consent to take a P300 CIT. It is when a person is coerced into taking a P300 CIT that these rights will be engaged, and there must a legal justification for that coercion. The next heading will explore the potential for coercion, and discuss if, or when, coercion may be lawfully justifiable.

¹⁷³ *Selvi*, above n 168.

¹⁷⁴ New Zealand Bill of Rights Act, s 21.

¹⁷⁵ Section 5.

¹⁷⁶ Sir Thomas Thorp *Miscarriages of Justice* (Legal Research Foundation, Auckland, 2005).

¹⁷⁷ P v T [1998] 1 NZLR 257 at 258.

B Coercion

It is very unlikely that an unwilling participant could be physically coerced into taking a P300 CIT, because it would be practically difficult. The test requires the person to sit still and pay attention to the presented stimuli for a significant amount of time.¹⁷⁸ All a person would need to do to avoid taking the test is close their eyes. The more realistic concern is that people could be illegitimately coerced into taking the test, undermining their voluntary consent. This type of coercion is likely to occur where the subject's lack of understanding of the legal process is exploited to persuade them to take a P300 CIT. For example, the tester could tell the suspect that negative inferences will be drawn if they do not agree to cooperate with the test. In such situations the person may agree to cooperate, but that is not the free and informed consent that the law requires.

1. Are P300 CIT results physical or testimonial evidence?

Some evidence, such as a DNA sample, is able to be compelled under law on the basis that it is physical evidence. Testimonial evidence cannot be compelled under law. The classification of the P300 CIT as physical or testimonial evidence will therefore affect whether it will be lawfully justifiable to obtain results by coercion.

There is a strong principle in New Zealand that a person cannot be compelled to be a witness against themselves.¹⁷⁹ In the United States of America, this right is contained in the Fifth Amendment to the Constitution: "no person ... shall be compelled in any criminal case to be a witness against himself".¹⁸⁰ United States jurisprudence on this topic can therefore guide how the P300 CIT might be considered in relation to this right in New Zealand. The United States Supreme Court has held that the protection against self-incrimination outlined in the Fifth Amendment is attracted only by *testimonial* evidence; a suspect may still be incriminated by their own *physical* evidence, such as the results of a blood test.¹⁸¹ A suspect can therefore be compelled to provide physical evidence, but not testimonial evidence.¹⁸² This distinction, and

¹⁷⁸ Lawrence Farwell "Farwell Brain Fingerprinting Executive Summary" (2013) Larry Farwell www.larryfarwell.com.

¹⁷⁹ New Zealand Bill of Rights Act s 25(d); Evidence Act, s 73(1).

¹⁸⁰ United States Constitution, amend 5.

¹⁸¹ Schmerber v California, 384 U.S. 757, 764 (1966).

¹⁸² Above n 181.

prohibition on obtaining testimonial evidence through coercion, likely arose to protect people, and to prevent people being tortured into making false confessions and causing miscarriages of justice.¹⁸³

This differentiation of physical and testimonial evidence can also be found in New Zealand law. A suspect's testimonial statements attract a number of protections – they have the right to refrain from making a statement, ¹⁸⁴ they must be informed of that right and its possible consequences ¹⁸⁵ and, if the statement is improperly obtained, it may be excluded. ¹⁸⁶ Physical evidence operates under a different set of rules. The Land Transport Act states that a person *must* permit a blood specimen to be taken if they fail or refuse to undergo an evidential breath test. ¹⁸⁷ The Criminal Investigations (Bodily Samples) Act 1995 allows a Judge to order a person to give a bodily sample if there is good cause to believe that they have committed a specified offence, even if the suspect has refused to consent to the taking of a sample. ¹⁸⁸ These Acts do include safeguards, but it is clear that physical evidence is held to a different standard than testimonial evidence, and may be compelled under the law in some circumstances.

Whether a person can be lawfully compelled to take a P300 CIT will therefore depend on the definitions of physical and testimonial evidence. The United States Supreme Court has already attempted to draw these definitions. In *Pennsylvania v Muniz*, the term 'testimonial' was broken down to ascertain which aspect of testimony garners the legal protection: is it the *act* of communication, or is it the *product* of the communication?¹⁸⁹ They suggested that it is the active role that the defendant must play in the disclosure that triggers the protection. If that is applied to the P300 CIT, it would not be protected testimonial evidence, because obtaining a result does not require the defendant to play an active role. If it is the product of the communication that is relevant, the P300 CIT results would almost certainly attract the protection afforded to testimonial evidence. While this is informative for the New Zealand approach, it is certainly not a clear decision.

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¹⁸³ Charles L Yeschke *The Art of Investigative Interviewing: A Human Approach to Testimonial Evidence* (2nd ed, Butterworth–Heinemann, United States of America, 2003) at 11.

¹⁸⁴ New Zealand Bill of Rights Act, s 23(4).

¹⁸⁵ Section 23(4).

¹⁸⁶ Evidence Act, s 30.

¹⁸⁷ Land Transport Act 1998, s 72.

¹⁸⁸ Criminal Investigations (Bodily Samples) Act 1995, s 13(1).

¹⁸⁹ Pennsylvania v Muniz 496 U.S. 582, 596 (1990).

There are two approaches that New Zealand could take to classifying P300 CIT results as either physical or testimonial evidence: a pro-use approach or a rights-focussed approach.

(a) The pro-use approach

This approach would treat P300 CIT results as analogous to DNA, and put more weight on the fact that the P300 CIT is likely to produce useful evidence. The P300 CIT would be analogised to the taking of a blood sample or DNA test, which is a fair comparison: in both tests there is some data gathered from a physical aspect of the body that is then presented as evidence. Under this approach, the P300 CIT would be classified as physical evidence. This would mean its safeguards would be lessened, and there would be some circumstances where obtaining a P300 CIT by coercion could be lawfully justified.

(b) The rights-focussed approach

This approach would treat P300 CIT results as analogous to witness testimony, and put the weight on the fact that the coerced taking of a P300 CIT infringes on a number of human rights. Brain Fingerprinting has been described as producing testimonial physiological responses that force the subject to divulge the contents of their mind, and it is near impossible to describe the contents of a mind as physical evidence. Under this approach, the P300 CIT would be classified as testimonial evidence, meaning that obtaining a test through coercion would not be lawfully justifiable in any circumstances.

Both approaches have positive and negative features, and like many aspects of the law, reasonable people will differ in what approach they think is the correct one, based on their own morals and values. As alluded to above, the United States appears to be leaning towards the pro-use approach in similar contexts. The United States Supreme Court has already decided that a DNA sample obtained by a cheek swab is analogous to a fingerprint, and thus can be classified as physical evidence and will not attract the protection of the Fifth Amendment. ¹⁹¹ The Court put forward three main justifications: there was legitimate government interest in obtaining the swab, it was an extension of methods already in use and there was minimal

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¹⁹⁰ Jody Barillare "As Its Next Witness, The State Calls... The Defendant: Brain Fingerprinting as "Testimonial" Under the Fifth Amendment" (2006) 79 Temp. L. Rev. 971.

¹⁹¹ Maryland v King 569 U.S. 435 (2013).

intrusion into the defendant's legitimate expectation of privacy. ¹⁹² A similar ruling regarding DNA evidence was made by the European Court of Human Rights in 1996. The Court stated that the right not to incriminate oneself did not extend to bodily material that has an "existence independent of the will of subject". ¹⁹³ These reasons could potentially be applied to the P300 CIT. This, together with the suggestion in *Muniz* that P300 CIT results would not attract the protections afforded to testimonial evidence, indicates that both Europe and the United States may classify P300 CIT results as physical evidence, thus reducing the protections they would be afforded and increasing the circumstances in which they may be lawfully obtained by coercion.

The P300 CIT should arguably not be analogised to a DNA sample for the purpose of classifying it as physical evidence. The two are significantly different, and the better approach is to treat them as such. Although the brainwaves measured by the P300 CIT are the result of a physical process, there is no tangible product. This can be contrasted to a DNA sample, where the product is a tangible thing. Both of these techniques disclose information that would otherwise be kept private unless the defendant chose to disclose it, but the information obtained by each is quite different. The results of a DNA test produce clear information that is verifiable by other laboratories. There are no actions that the accused can take to contaminate the results. In comparison, research suggests that P300 CIT results can be affected by countermeasures taken by the test subject, meaning that these results should be treated with more care, and subjected to more scrutiny, than DNA test results. 194 Further, the process of obtaining P300 CIT results is more complex than that of obtaining a DNA sample. The latter is a one step process. The sample is obtained with a cheek swab, and tests are performed on the sample to gather the required evidence. To obtain P300 CIT results, the tester must correctly apply the electrodes to the skull, present the stimuli, obtain an EEG, an expert must interpret that EEG, and that interpretation then becomes the evidence that would be given in court. The more complex the process, the more room there is for error. An error in these circumstances could have a significant effect on the verdict, so P300 CIT results should be subjected to a higher level of scrutiny and attract greater protections than DNA test results. It would therefore be a mistake to classify P300 CIT results as physical evidence, remove the protections that they should be afforded and enable them to be obtained by compulsion.

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¹⁹² At [447]–[452].

¹⁹³ Saunders v UK (Application 19187/91) (1996) 23 EHRR 313 at [68–69].

¹⁹⁴ See chapter II for a more detailed discussion; Rosenfeld, above n 15.

2. International jurisprudence: what does it suggest?

(a) Support for the pro-use approach

Article 8 of the European Convention on Human Rights codifies the right to respect for a private life, which protects a person's physical and psychological integrity, and their personal data.¹⁹⁵ While New Zealand is not a signatory to this convention, it provides a useful litmus test for how these issues would be considered internationally, and has previously been used to provide guidance in New Zealand cases.¹⁹⁶ The P300 CIT is a scientific technique that yields personal information, so if that information is used against the subject's wishes, it interferes with this right.¹⁹⁷ However, interference is not equivalent to violation, and is justifiable under article 8 if it is in accordance with the law, serves a legitimate interest, and is necessary in a democratic society.¹⁹⁸ This idea of justifiable interference with rights is reflected in the NZBoRA: rights are not absolute.¹⁹⁹ This would provide some support for adopting the prouse approach, provided that there is a legitimate aim that would be achieved by the coercive use of the P300 CIT.

(b) Support for the rights-focussed approach

The International Covenant on Civil and Political Rights can also provide some guidance. New Zealand is a signatory to this covenant, so it is more relevant here. Article 7 states that no one shall be subject to degrading treatment or scientific experimentation without their free consent.²⁰⁰ Article 10 provides that all persons deprived of liberty shall be treated with humanity and with respect for the inherent dignity of the human person.²⁰¹ This wording is exactly replicated in the NZBoRA, suggesting that this inherent dignity is something our

¹⁹⁵ Council of Europe "Convention for the Protection of Human Rights and Fundamental Freedoms" 4.XI.1950, article 8.

¹⁹⁶ For example, *Taunoa v Attorney-General* [2007] NZSC 70, where the European Convention on Human Rights was used to support a finding of a breach of the New Zealand Bill of Rights Act s 23(5).

¹⁹⁷ Sjors LTJ Lighart "Coercive neuroimaging, criminal law, and privacy: a European perspective" (2019) 6 Journal of Law and the Biosciences 289.

¹⁹⁸ Council of Europe "Convention for the Protection of Human Rights and Fundamental Freedoms" 4.XI.1950, article 8.2.

¹⁹⁹ New Zealand Bill of Rights Act, s 5.

²⁰⁰ International Covenant on Civil and Political Rights GA Res 2200A (1976), art 7.

²⁰¹ Article 10.

society places significant value on.²⁰² This is particularly relevant when considering the place of the P300 CIT in New Zealand law for two reasons: first, the human mind and personality seems to be the reason that human persons shall be afforded inherent dignity, and second, because of how it relates to tikanga Māori and the Treaty of Waitangi.

We as humans differentiate ourselves from anything else on the planet based on our brains. It therefore seems reasonable to isolate the human mind and personality as the basis of the inherent dignity of the human person.²⁰³ Coercive use of the P300 CIT would threaten this, because it goes to the mind of the person, and makes public very personal information that could and should not be made public unless the defendant chooses to disclose it.

3. The Treaty of Waitangi

The principles of the Treaty of Waitangi impose a duty on the Crown to engage in active protection of Māori interests, which has been held to include tikanga.²⁰⁴ According to tikanga, the head is tapu, meaning that it should not be touched without permission. If a Māori person is compelled to take a P300 CIT, their head will be touched without permission, thus violating tikanga. The Crown is required to uphold this duty in circumstances where it is reasonable to do so, and such a recognition of tikanga in this context appears to be reasonable.²⁰⁵

4. Justifiable coercion

Returning back to the classification of the P300 CIT as physical or testimonial evidence, it is likely that the New Zealand courts would prefer the latter. This classification is consistent with the rights-focussed approach, and would restrict the circumstances in which it can be lawfully

²⁰² New Zealand Bill of Rights Act, s 23(5).

²⁰³ The idea that the human brain and personality is inviolable has captured the public imagination, and has been considered by everyone from science fiction writers to academics. It is a common theme in science fiction literature, with George Orwell's *1984* (Secker & Warburg, London, 1949) being the most famous example. The idea has been verbalised in court: "if there is a quintessential zone of human privacy it is the mind" (*Long Beach*, above n 64 at [944], per Broussard J). It has appeared in blogs: "[w]e view techniques for peering inside the human mind as a violation of the 4th and 5th Amendments, as well as a fundamental affront to human dignity" (Jay Stanley "High-Tech "Mind Readers" Are Latest Effort to Detect Lies" (29 August 2012) Free Future < www.aclu.org>), and in peer-reviewed academic articles (see, for examples, Francis X Shen "Neuroscience, Mental Privacy, and the Law" (2013) 36 Harvard Journal of Law and Psychology 653; William Federspiel "*1984* Arrives: Thought(Crime), Technology, and the Constitution" (2008) 16 William and Mary's Bill of Rights Journal 865).

²⁰⁴ New Zealand Maori Council v Attorney-General [1994] 1 NZLR 513 (PC).

²⁰⁵ New Zealand Maori Council v Attorney-General [1987] 1 NZLR 641 at 372.

compelled to almost none. Although some similarities can be drawn between the P300 CIT and other physical evidence, such as DNA, it should be considered significantly different. Classifying it as testimonial evidence differs from the approach that the United States and Europe appear to be favouring, but that approach arguably overlooks some key features of the P300 CIT, and some fundamental rights. Senior courts in New Zealand have demonstrated that they will give significant weight to the rights encapsulated in the NZBoRA: in 2015, the High Court made a declaration of inconsistency with the NZBoRA.²⁰⁶ Classifying the P300 CIT as testimonial evidence and following the rights-focussed approach would also allow for a greater degree of regulation and a lower risk of abuse, both things that are important to consider when dealing with a novel scientific technique. Finally, restricting the circumstances in which coercively taking a P300 CIT could be lawfully justifiable upholds the Crown's duty of active protection under the Treaty of Waitangi.

Overall, the results of a P300 CIT are likely to be considered testimonial evidence, and it is unlikely that they could ever be lawfully compelled. This narrows the class of people that are likely to use the P300 CIT. It is very unlikely that a guilty defendant would consent to it, as it would likely support the case against them. It is most likely to be used by an innocent suspect to support their defence. Blackstone's Ratio again becomes relevant. Classifying the P300 CIT as testimonial evidence will restrict the number of people who are likely to use it, but those people belong to the vulnerable class that the legal system should give every chance to demonstrate their innocence.

CSelvi: A Case Study

While the idea that compelling a test like the P300 CIT may seem far-fetched, Selvi, a recent case heard in the Supreme Court of India, demonstrates that it can happen.²⁰⁷ This case concerned the coercive use of novel scientific techniques. The appellants had been involuntarily administered with three techniques, and argued that this was unconstitutional. The techniques in question were polygraph examination, narcoanalysis and brain electrical activation profile. The polygraph is the standard lie detection test, ²⁰⁸ narcoanalysis involves the intravenous administration of a drug causing the individual to enter a hypnotic state and

 $^{^{206}}$ Taylor v Attorney-General [2015] NZHC 1706. 207 Selvi, above n 168.

²⁰⁸ At [10].

become more likely to divulge information,²⁰⁹ and the brain electrical activation profile is a type of neuroimaging similar to the P300 CIT.²¹⁰ *Selvi* can therefore provide some insight into how a court might treat the coercive use of a neuroimaging technique.

The appellants argued that the use of these techniques contravened the Indian Constitution and the Code of Criminal Procedure. Specifically, article 20(3) of the Constitution states that "[n]o person accused of any offence shall be compelled to be a witness against himself',²¹¹ and art 21 states that "[n]o person shall be deprived of his life and liberty except according to procedure established by law".²¹² Section 161(2) of the Code of Criminal Procedure protects against a defendant's self-incrimination.²¹³ Similarities can be drawn between that protection and s 73(1) of New Zealand's Evidence Act.²¹⁴

The respondents based their defence of the involuntary administrations on three key justifications:

- 1. The information gained could help to prevent future crimes.
- 2. Administering the techniques did not cause any physical harm to the individuals.
- 3. The information obtained was only going to be used for strengthening investigation efforts, and would not be admitted as evidence at trial.

The outcome of this case cannot be perfectly imported into New Zealand law – one of the State's arguments was that these tests should be allowed because the alternative was 'third degree' methods of interrogation, ²¹⁵ such as physical torture, ²¹⁶ which are unlikely to be used in New Zealand. It does, however, provide an interesting insight into what barriers a court may employ to prevent P300 CIT results being admitted as evidence. Here, the protection against self-incrimination was strongly upheld. The Court allowed the appeal, holding that the results obtained by the tests were personal testimony, and thus attracted the protection of art 20(3).

²¹⁰ At [67].

²⁰⁹ At [41].

²¹¹ Constitution of India 1950, 104th Amendment 2020, article 20(3).

²¹² Article 21

²¹³ The Code of Criminal Procedure 1973 (India), s 161(2).

²¹⁴ Evidence Act, s 73(1).

²¹⁵ Selvi, above n 168, at [218];

²¹⁶ Jinee Lokaneeta *The Truth Machines: Policing, Violence and Scientific Interrogations in India* (1st ed, University of Michigan Press, Michigan, 2020) at 38.

This case therefore provides further support for classification of the P300 CIT as testimonial evidence.

Chapter VI Matters of Practicality

A Matters for Consideration

1. Overcoming the barriers

This dissertation has identified a number of barriers to the introduction and incorporation of the P300 CIT in New Zealand law. These include its scientific validity, public perception and human rights issues. The decision of whether the use of the P300 CIT is worth advocating is therefore a question of whether these barriers could and should be overcome in the interests of justice. The effort of overcoming them has to be weighed against the potential value of the P300 CIT.

There is some academic interest in the P300 CIT in New Zealand. Robin Palmer and his research team have identified a comprehensive list of factors that will test the reliability and the accuracy of the P300 CIT to determine whether it should be incorporated in New Zealand law.²¹⁷ He concludes that once testing is complete, the P300 CIT has the potential to make a "significant contribution to the administration of justice", particularly in the area of criminal justice.²¹⁸ In 2016, Palmer and his team were awarded a grant from the New Zealand Law Foundation to assess the potential of engaging in longer term studies of the P300 CIT to research issues arising from its potential incorporation into the legal system.²¹⁹

2. International use of concealed information tests

At present, the CIT is only applied in criminal investigations on a large scale in Japan.²²⁰ There are about 100 examiners in the country, and they collectively deal with around 5,000 cases per year.²²¹ They use a polygraph with a CIT, which is not the same as the P300 CIT. The former

²¹⁷ Palmer, above n 25 at 353–354.

²¹⁸ At 355.

²¹⁹ "Pilot Project: The Brain Does Not Lie: the use of Forensic Brainwave Analysis and Neuroscience in Criminal and Civil Investigations." New Zealand Law Foundation, Grant 2016/43/6.

²²⁰ Izumi Matsuda, Tokihio Ogawa and Michiko Tsuneoka "Broadening the Use of the Concealed Information Test in the Field" (2019) 10 Frontiers in Psychiatry 24 at 24.

²²¹ Akemi Osugi "Daily Application of the Concealed Information Test: Japan" in Bruno Verschuere, Gershon Ben-Shakhar and Ewout Meijer (eds) *Memory Detection: Theory and Application of the Concealed Information Test* (Cambridge University Press, New York, 2011) at 253.

does not rely on any brain-based responses, and instead assesses physiological responses in a similar manner to the CQT. Both the polygraph with a CIT and the CQT rely on physiological responses to make assessments, but the former focusses on detecting the presence of information, while the latter focusses on detecting deception. The polygraph with a CIT therefore avoids that subjective assessment.

The CIT in Japan is used most frequently in criminal investigations, and the test results are rarely used as evidence in court.²²² However, that is not to say that it is inadmissible in court.²²³ In 1986 Japan's Supreme Court admitted polygraph results as evidence in court, and the probative value of CIT results can be high if the test has been properly conducted.²²⁴

The Japanese model for the use of a CIT on a daily basis provides an example of how New Zealand could incorporate a CIT. It also supports the argument that the P300 CIT can be valuable in the legal system before it is admitted to the courtroom. Although the Japanese CIT is not exactly the same technology as that which has been the focus of this dissertation, the Japanese legal system is similar enough to New Zealand's that the fact that it is being used daily speaks in favour of the practicality of incorporating a similar test into our legal system, and suggests that the hypothesised difficulties of transferral from the laboratory to the field can be overcome.²²⁵

3. A potential framework for use of the P300 CIT

The use of the CIT in Japan also provides a potential framework for the practical aspects of introducing the P300 CIT. In Japan, examiners are required to have at least a Bachelor's degree in some area of psychology, and then undergo training at a national training centre to cultivate the specialised skills.²²⁶ There are 100 examiners in the country,²²⁷ for a population of 126.5 million.²²⁸ To give a comparable ratio New Zealand would require just four examiners. Although the results of a P300 CIT require some specialised training to interpret, it is not an

²²² At 28.

²²³ At 28

²²⁴ Edward Chen "The Legal Training and Research Institute of Japan" (1991) 22 U Tol L Rev 975.

²²⁵ Elliot J Hahn "An Overview of the Japanese Legal System" (1983) 5(3) Northwestern Journal of International Law & Business 517.

²²⁶ Osugi, above n 221, at 253.

²²⁷ Chen, above n 224.

²²⁸ United Nation Population Division "Population, total – Japan" (2020) The World Bank <data.worldbank.org>.

overly complicated scientific process, and training people in the correct use of the technology would not be prohibitively difficult. The technology required for carrying out a P300 CIT is the same as that required to obtain an electroencephalogram.²²⁹ This technology is well-established in New Zealand, and it is likely to be financially feasible.

A key feature of the Japanese system that New Zealand should incorporate is neutral examiners. In Japan, the examiners are not members of the police, so they do not bring with them the inherent coercive power of the State. This helps to avoid the risk of obtaining a P300 CIT by unjustifiable coercion.

4. Teina Pora: a case study

To illustrate the potential value of the P300 CIT in New Zealand, I invite the reader to consider the case of Teina Pora. Pora was convicted of the rape and murder of Susan Burdett in 1994.²³⁰ He confessed to the crime during police questioning, but later claimed that he had been lying in order to get the reward. Pora suffers from foetal alcohol syndrome, which is known to affect executive function and the ability to consider the consequences of an action, which could cause him to falsely confess to a crime.²³¹ In 1999, his convictions were quashed and a re-trial was ordered,²³² but in 2000 he was again found guilty.²³³ Pora appealed again, and was granted permission to take his case to the Privy Council. Finally, in 2015, after spending 21 years in prison, his convictions were quashed.²³⁴ This is an example of a case that Blackstone's Ratio directs the law to avoid. If the P300 CIT had been available it could have been extremely valuable in two ways. First, if Pora had taken a P300 CIT in the early stages of the investigations, the investigators would have seen that Pora's brain did not contain the crime relevant details. His brain would not have produced the P300 ERP in response to being shown the murder weapon, or Burdett's house, for example, and the police could have ruled him out as a suspect. Second, if Pora's defence lawyer had been able to advise Pora to take a P300 CIT, he would have had evidence to put before the jury to support the case that Pora did not have

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²²⁹ Michael R Winograd and J Peter Rosenfeld "Mock crime application of the Complex Trial Protocol (CTP) P300-based concealed information test" (2011) 48 Psychophysiology 155 at 156.

²³⁰ R v Pora [1994] 1 HRNZ 273.

²³¹Pora v R [2015] UKPC 9 at [36]–[37].

²³² R v Pora [1999] BCL 1172.

²³³ R v Pora [2000] 18 CRNZ 259.

²³⁴ *Pora v R* [2015] UKPC 9.

knowledge of vital aspects of the crimes he was accused of. This demonstrates the value that the P300 CIT could have, both in the investigative context and in the courtroom.

B Is There Merit in Advocating for the P300 Concealed Information Test?

The answer is arguably simple: yes. It provides something of value to both innocent people and the justice system as a whole, and that is worth a lot. New Zealand may have a somewhat cautious approach to novel scientific evidence, but the courts have shown that they are open to admitting novel scientific techniques.²³⁵ It is likely to pass the relevant criteria – if not immediately, then in the near future, and it is likely that it could eventually be admitted as evidence.

I have referred to Blackstone's Ratio throughout this dissertation, but it bears repeating here. It is better that ten guilty people walk free than one innocent person be sent to prison. It is clear that the P300 CIT has its limitations, but if it gives that one innocent person the evidence they need to walk free, then it is worth advocating for. It is important to remember that the chances of a false positive result are so low that it is very unlikely that an innocent person would ever get a positive result.²³⁶ The possibility that the results of a P300 CIT may not be admissible as evidence in court should not bar it from entering the legal system. It is better to take small steps in the right direction rather than wait until we can take a leap to the finish line, and the use of the CIT in Japan shows that it can be valuable in an investigative context in addition to a judicial one.

²³⁵ Shepherd, above n 107; Calder, above n 103; Lundy F, above n 111.

²³⁶ Rosenfeld, above n 15.

Conclusion

In many ways, the P300 CIT is a novel piece of technology. It purports to intrude upon the most private domain any human can claim, that which is the last refuge of the guilty and the last hope of the innocent: the human mind. It is not surprising that reactions this technology evokes tend towards the visceral and the extreme. It is a fear that has been preyed upon by science fiction writers and film-makers, and one that tends to be over-dramatised.

This dissertation has discussed the science behind the P300 CIT and assessed it against the scientific standards found in the law. It has explored the relationship between the scientific and legal standards it will have to meet, and has found that it is likely to be at the point where it could provide significant value to the New Zealand legal system. It has drawn on a range of international jurisprudence to draw analogies between the scientific techniques that are already utilised in the law and the P300 CIT, and it has found that New Zealand should depart from the apparent international trends in the interests of upholding and protecting human rights.

I have referred to three key points repeatedly throughout this dissertation, and I will reiterate them one final time. First, the P300 CIT is a new and interesting technology – but so was a blood test once. The law must be careful not to overreact to the P300 CIT simply because it is a new, brain-based, technology. Novel technologies have been incorporated and regulated in the past, and can be again. Second, the P300 CIT should be assessed in the context of the processes and procedures that are already present in the law. It should be questioned and pushed to improve, but we should not expect perfection. The law does not require anything to be 100% certain, and the P300 CIT should not be treated any differently. Third, regard should always be had to Blackstone's Ratio, which states that it is better that ten guilty individuals go free than one innocent be sent to prison. The P300 CIT has potential for supporting the prosecution of a guilty person, but framing it in the context of having the potential to support the exoneration of the innocent shows where it will arguably have the most value.

There are two key factors specific to New Zealand indicating that our legal system is ready for this technology. First, New Zealand courts have shown themselves to be willing to admit novel scientific evidence, as demonstrated by the three key cases I have discussed. The *Lundy* cases demonstrated some failings of the system, but such mistakes should be used to guide future

courts in their considerations of these new technologies rather than justify the exclusion of new scientific evidence. Second, New Zealand has recently demonstrated an interest in ensuring that the legal system makes the correct verdicts. On the 1st of July this year, the Criminal Cases Review Commission Act 2019 came into force, establishing an independent Crown entity with the mandate to investigate possible miscarriages of justice.²³⁷ The P300 CIT provides valuable evidence to support such investigations, to direct new investigations and to provide evidence in court.

Finally, science is progressing incredibly fast, and it is likely that there are new scientific techniques already progressing along the path to the courtroom. New Zealand is likely to have the chance in the near future to set a precedent of forward-thinking incorporation, and open the courts to new forms of evidence that are likely to improve the fairness and justice of our legal system. The structures are there. All they need to do is take it.

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²³⁷ Criminal Cases Review Commission Act 2019, s 3.

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