THE INFLUENCE OF FMRI LIE DETECTION EVIDENCE ON JURY DECISION MAKING FOLLOWING POST-TRIAL DELIBERATIONS

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Functional magnetic resonance imaging (fMRI) is a technology that is used to study the function of the brain. It has been suggested that fMRI could be utilised as a lie detection device. However, many believe that the admittance of fMRI lie detection evidence into the courtroom would be premature, as it is feared that the evidence could have a very persuasive effect on jurors. The current study assessed the veracity of these beliefs and explored whether this effect is more prominent amongst juries or individual jurors. Individual verdicts were found to differ from group verdicts. Yet both on an individual and a collaborative basis, jurors favoured acquittal when presented with fMRI evidence, compared to other forms of lie detection evidence.

Keywords: fMRI, scientific evidence, cultivation theory

The last 30 years has been described by some as a "technology revolution" (Silberglitt, Anton, Howell, Wong, & Gassman, 2002, p. 2). This period has seen huge scientific and technological growth (Shelton, Kim, & Barack, 2007). Scientific growth has led to the development of technology which has the ability to assist in criminal investigations. This technology has given police the ability to analyse DNA evidence and allegedly detect lies, both factors which are pivotal in ascertaining innocence and guilt. The widespread use of these techniques has led to scientific evidence becoming ubiquitous within the courtroom (Gross, 1991). Due to the complexity of the scientific evidence now used in the courtroom, it often is presented by expert witnesses whose role is to inform the jury of the complex procedures used to gather and evaluate scientific evidence and to provide their interpretation of the findings (Devine, Clayton, Dunford, Seying, & Pryce, 2001; Zeedyk & Raitt, 1998). Expert witnesses can provide testimony on a wide range of evidence such as DNA, ballistic tests, and the analysis of lie detection data.

However, despite their inclusion in approximately 56% of criminal trials, there is still contention over whether juries fully understand the application and indeed the limits of complex scientific evidence (Hans, 2007; Sonenshein & Fitzpatrick, 2013). While concerns continue to surround the accuracy and reliability of the techniques used to gather the scientific data, concerns have begun to be raised regarding the influence that the mere

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presence of scientific evidence may have on potential jurors (Baertschi, 2011; Stern, 2002; Wolpe, Foster, & Langleben, 2005).

Serious questions have been raised regarding juror's competency and ability to understand expert scientific testimony (Honess & Charman, 2002; Penrod, Bornstein, Nemeth, & McAuliff, 2003). The implied certainty and authority of science can prove particularly prejudicial to jurors (Wolpe et al, 2005). The white coat effect refers to when jurors base their evaluation of the evidence on heuristic cues or cognitive short cuts associated with the expert witness, such as their presentation, demeanour and credentials (Kovera, McAuliff, & Herbert, 1999). This effect is particularly prominent when the evidence being presented is highly complex resulting in jurors becoming confused and thus relying upon heuristic cues (Cooper, Bennett, & Sukel, 1996; Lieberman, Carrell, Miethe, & Krauss, 2008). Indeed, it even has been suggested that certain forms of scientific evidence could themselves be considered as cognitive short cuts. For example, the popularity of fictional crime dramas and high profile news stories possibly is believed to have created preconceived beliefs amongst jurors regarding the reliability of certain forms of forensic evidence, particularly DNA evidence, which erroneously is perceived by jurors to be 95% accurate (Lieberman et al., 2008). Researchers argue that the ubiquitous presence of DNA evidence in popular media has led to it gaining a "special aura of certainty" and "mystic infallibility" that has resulted in its very presence becoming a heuristic cue for jurors, who have come to view DNA evidence as a definitive indicator of guilt (Lieberman et al., 2008, p. 32).

In recent years, similar technologies have emerged in the courtroom which also might gain a comparable level of perceived authority due to their scientific rigour, perceived accuracy and biological foundations (McCabe, Castel, & Rhodes, 2011). For example, fMRI now is being regarded as a form of lie-detection technology (Ogawa, Lee, Kay, & Tank, 1990). It has been developed to fulfil the demand for an objective lie-detection measure, driven in part by increasing concerns surrounding international security (Langleben, 2008; Wolpe et al., 2005). In the context of lie detection, fMRI is used to identify specific brain regions that are associated with effort or conflict. These brain regions are believed to be activated significantly during deception (Kozel, Johnson, Mu, Grenesko, Laken, & George, 2005). It is alleged that fMRI can identify lies with an accuracy ranging from 86 to 90% (Simpson, 2008). However, others argue that these estimates are overly optimistic and believe that the implementation of the current technology in a legal setting would be premature (Ford, 2006).

Indeed, Baertschi (2011) suggests that if fMRI lie detection evidence is permitted into the courtroom it could have a very persuasive and damaging effect on jurors. These concerns seem to be supported by a number of studies, which indicate that neuroimaging techniques, such as fMRI, already possess an "aura of certainty" (Lieberman et al., 2008, p. 32) in the eyes of jurors. Gurley and Marcus (2008) found that when testimony was accompanied by an image of a brain scan, the number of not guilty by reason of insanity verdicts almost doubled (19% vs. 37%). The authors argue that these results do not prove that jurors are influenced unduly by fMRI evidence. They suggest that, instead, fMRI may be providing jurors with the information they require to establish a correct verdict.

However, several studies have demonstrated that this overly optimistic stance is not justified (Racine, Bar-Ilan, & Illes, 2005). Weisberg, Keil, Goldstein, Rawson and Gray (2008) have shown that the addition of neuroscience data can not only increase confidence in good explanations, but also can transform bad explanations into good ones. Similarly, McCabe and Castel (2008) reported that subjects were more likely to deem the scientific reasoning of cognitive neuroscience studies as valid when the study was presented alongside brain images, rather than other images. Both of these studies highlight how the authority of science and brain images can mislead an uninformed public (Baertschi, 2011).

The potential influence of neuroimaging evidence over other scientific techniques was further reinforced by McCabe and colleagues (2011), who found fMRI to be significantly more influential than alternative forms of lie-detection evidence, such as the polygraph. In their study they found that over 75% of participants in the fMRI condition reached a guilty verdict compared to only about 45% of participants in the polygraph condition. The researchers suggest that this is due to fMRI providing a more explicit link between biology and behaviour than other lie detection technologies (McCabe et al., 2011).

How juries incorporate scientific evidence into their decisions

The presence of scientific evidence in a trial is only one factor in the complex process of jury decision making. How the evidence is perceived by the individual juror and subsequently reviewed in the deliberation process also can impact greatly the jury's final decision. One of the most prominent cognitive models of jury decision making is Pennington and Hastie's (1992) Story Model, which suggests that jurors incorporate trial information into one or more plausible stories. The story with the most plausible, supporting evidence is retained and informs the juror's final verdict. Crucially, these stories are not based solely on the evidence presented, but also reflect jurors' attitudes and experiences. These attitudes are formed primarily by previous exposure to and the perceived authority of the evidence presented.

According to Cultivation Theory, media exposure can influence perceptions of social reality (Gerbner, 1998). Research has shown that heavy television viewing can influence people's views on social issues such as age, gender and politics. Individuals, who are exposed to a lot of television tend to glean their conceptions about the world from the media. Thus, these individuals often possess views that reflect more of a television reality rather than a social reality (Hayes-Smith & Levett, 2011). The CSI Effect refers to the phenomenon by which television crime shows, like CSI, cultivate and shape people's perceptions of social reality in terms of forensic evidence (Hayes-Smith & Levett, 2011). It could, therefore, be seen as a genre-specific version of the broader Cultivation Effect. Schweitzer and Saks (2007) identified two possibilities for how the CSI Effect could affect trial judgements. One possibility posits that the effect adds to the burdens of the prosecution, and the other asserts that it adds to the burdens of the defence.

The pro-prosecution theory suggests that if forensic evidence is present, jurors who watch crime dramas may focus predominantly on the forensic evidence, giving it more weight than the other evidence and increasing the likelihood of a guilty verdict. The pro-

defence theory states that if forensic evidence is absent, it may cause jurors who watch crime dramas to be skeptical of testimony or other common trial evidence. Thus, jurors will be more likely to acquit the defendant.

The potential impact of perceived authority and media exposure is dependent upon juror competency, which plays an important role in the decisionmaking process. The extent to which the juror understands the evidence determines how likely they are to fully appraise and scrutinise the evidence through systematic processing (Chaiken & Maheswaran, 1994) or simply resort to heuristic cues (McCoy, Nuñez, & Dammeyer, 1999). Two models have been identified which represent the contrasting extremes of a competence-related continuum. The Satisficing Model is at the low performance end of the continuum. At the satisficing end of the continuum, only a single plausible story is constructed from the evidence. Discrepant evidence or alternative possibilities fail to be acknowledged and the verdict is considered the most satisfactory match. At the other end of the continuum is a model of optimum performance known as the Theory-Evidence Co-Ordination Model. The Theory-Evidence Co-Ordination model of processing involves the construction of multiples stories. In order to reach a verdict, each story must be evaluated against the evidence and against the alternatives. The verdict that has the most consistent and least discrepant evidence associated with it will be chosen (Kuhn, Weinstock, & Flaton 1994).

It is evident, therefore, that on an individual basis, the presentation of scientific evidence can be problematic due to its reliance upon individuals' diverse levels of competence. The potential negative impact of individual competence can be offset by employing groups, which are considered to possess collective superior reasoning skills and competency (McCoy et al., 1999). This is because groups are more likely to employ the more complex Theory-Evidence Co- ordination Model described above (Kuhn et al., 1994). More specifically, due to the average collective recall of the jury being superior to that of individual jurors, more evidence will be recalled and, therefore, available for consideration during the deliberation process (Kalven & Zeisel, 1966). This then increases the chance of alternative theories being discussed, which in turn increases the likelihood that jurors will engage in systematic rather than heuristic processing. In addition, there is evidence that jury deliberation can eliminate other biases such as situational biases, personal biases, and source monitoring errors (Kaplan & Miller, 1978; Kerwin & Shaffer, 1994). These findings support the theory that juries may give more accurate weight to expert scientific evidence than individual jurors.

However, not all evidence suggests that groups are less biased in decision making than individuals. Social influences sometimes can jeopardise higher-order reasoning, limiting the consideration of alternative theories or scenarios. Steiner (1972, as cited by Nuñez, McCrea, & Culhane, 2011) argues that the emergence of Social Loafing and the associated diffusion of individual responsibility can lead to vital information not being considered and a failure to engage in systematic processing (Stasser & Tittus, 1985). Similarly, Group Polarisation Effects often result in prior individual biases being amplified within the group (Isenberg, 1986). For example, the verdict preference initially held by the majority has been shown to accurately predict the final verdict in 90% of cases and will often prevail even if it

is incorrect (Sandys & Dillehay, 1995). We can see, therefore, why any preconceived ideas relating to scientific evidence could be highly problematic due to the potential exacerbation of biases that can occur during deliberation.

The Current Study

The current study is a pilot project that will provide a basis and foundation for future research. A pilot project was considered due to the novel nature of the research. Existing research in the field suggests that scientific evidence can be highly persuasive and potentially problematic for jurors (Gurley & Marcus, 2008; Weisberg et al., 2008). Its complexity and scientific prowess gaining scientific evidence an 'aura of certainty' and 'mystic fallibility' that could, potentially, nullify a juror's role in the decision-making process (Lieberman et al., 2008, p. 32). These concerns highlight the need for further research regarding juror perceptions of emerging scientific techniques such as fMRI. fMRI, although a relatively new technology, already appears to be developing its own "aura of certainty" (Lieberman et al., 2008. p. 32), with previous research demonstrating its perceived authority and influence over potential jurors (McCabe et al., 2011). However, some researchers argue that much of the existing literature regarding jury decision making, including that of fMRI, may not reflect real case outcomes. This is because, despite evidence that group decisions can differ from individual decisions by either exacerbating or eliminating biases, the majority of jury research to date has been conducted on the juror level and only extrapolated to the jury (Nuñez et al., 2011).The current study will address this gap in the literature by examining the influence of different forms of lie detection evidence, including fMRI, on individual juror and group verdicts. Verdict preference will be recorded at three time points during the study: individually prior to deliberation, as a group following deliberation and individually following deliberation. It was hypothesised that the type of lie detection evidence would impact upon both individual and group verdicts, with fMRI evidence yielding the largest number of guilty verdicts. In line with Kuhn and colleagues' (1994) model it was thought that group deliberations may eliminate biases in terms of lie detection evidence, and it was thus predicted that there would be a significant difference between the number of guilty verdicts in the pre-deliberation condition and the number of guilty verdicts in the individual post-deliberation condition. It was hypothesised that the number of guilty verdicts would be reduced, following group deliberation, as a result of jurors adopting a more sophisticated decision-making model.

METHOD

Participants

Thirty-two participants took part in the research. The participants were Teesside University students. University students were recruited through the SONA system. SONA is an internal computer system used by the University that allows students to sign up for research. The system records students' participation and rewards course credit accordingly (60 minutes). In order to take part in the research, participants had to be eligible for jury service in the UK. Hence all participants fulfilled the following criteria: being between the ages of 18 and 70 years old; being listed on the electoral register; having lived in the UK

for any period of at least five years since the age of 13; having never had a prison or youth custody sentence of more than five years; having never been in prison or youth custody for any length of time in the past 10 years; and having never had a mental health condition or mental disability.

Materials

Case vignette. The vignette used in this study was a hard copy of the abridged version of the vignette created by Kassin and Sommers (1997). The abridged version was first utilised in the pioneering study by McCabe and colleagues (2011).The vignette describes a case in which a defendant is accused of killing his estranged wife and her lover. The vignette was designed so that the prosecutor's evidence appeared ", incomplete, ambiguous and circumstantial" (Kassin & Sommers, 1997). Thus, reasonable doubt can be cast over the defendant's guilt. The vignette is compiled of 15 discrete points of evidence, each of which is numbered. The experimental manipulation involved differences in point 8 of the vignette. The experimental manipulation refers to the differences in the case vignettes across the three evidence conditions. In the control condition, point 8 stated that the second prosecution witness could not testify.

> The next witness, Dr. Ronald Tinsworth, did not testify because of a family emergency, which was confirmed by court personnel.

In the fMRI condition, point 8 was the prosecution witnesses' expert testimony. The testimony (point 8) is presented below:

> The next witness, Dr. Ronald Tinsworth, had recorded images of Givens' brain activity using functional magnetic resonance imaging (fMRI) while he was being interrogated by police. According to Tinsworth, there was increased activation of frontal brain areas when Givens denied killing his wife and neighbour, as compared to when he truthfully answered questions about things like his date of birth, or home address (this is shown in the figure to the right). Similar increases in frontal brain activity are known to occur when people are lying.

In the polygraph condition, point 8 was the prosecution witnesses' expert testimony. The testimony (point 8) is presented below:

> The next witness, Dr. Ronald Tinsworth, had recorded Givens' physiological responses using a polygraph machine while he was being interrogated by police. According to Tinsworth, there was increased physiological activity when Givens denied killing his wife and neighbour, as compared to when he truthfully answered questions about things like his date of birth or home address. Similar increases in physiological activity are known to occur when people are lying.

Verdict/response sheets. All of the response sheets had two boxes (guilty/not guilty). Participants were instructed to select one box. The response sheet for the post-

deliberation individual verdict differed slightly as it included a question regarding participant's motivation to alter their initial verdict following deliberation with the group.

Procedure

First participants were randomly allocated to one of the three evidence conditions (control, fMRI, or polygraph). Participant's verdict responses were measured at three time points. Each participant was presented with the case vignette containing the experimental manipulation. After reading the case vignette, each participant completed a response sheet providing an individual initial verdict of guilty or not guilty. Following the initial verdict participants were asked to deliberate in groups comprising of between two and six participants, all of whom were in the same experimental condition (for up to 60 minutes). Participants were instructed to reach a unanimous verdict. The deliberation process took place in absence of the researcher. As a group, the participants were required to complete another response sheet recording their group verdict. Following the group verdict, each participant was required to complete another response sheet detailing their final individual verdict preference. If this final verdict differed from that of the group, participants were instructed to provide details as to why they altered their decision.

Finally, participants were instructed to read a debrief form and asked to share any queries or concerns they may have with the researcher.

RESULTS

Examining the effect of evidence type on individual juror decisions (pre-deliberation)

In order to examine the effect of evidence type on individual juror decisions, verdicts first were recorded prior to any deliberation taking place. An exact chi-square analysis revealed that the type of evidence presented did not significantly affect the number of guilty verdicts: χ^2 (2, N=32)=2.15, p=0.37 (Table 1).

Examining the effect of evidence type on group decisions (post-deliberation)

An exact chi-square analysis revealed that number of guilty verdicts did differ significantly according to evidence condition: χ^2 (2, N=32)=8.94, p=0.01 (Table 1), with the polygraph condition yielding the most guilty verdicts and the fMRI condition the least.

Examining the effect of evidence type on individual juror decisions (post-deliberation)

An exact chi-square analysis revealed that whether participants found the defendant guilty did not significantly differ by the evidence condition: χ^2 (2, N=32)=5.50, p=0.07 (Table 1).

Table 1:

C*omparison of Verdicts Across the Three Evidence Conditions*

		fMRI	Polygraph	Control
Pre- deliberation	Guilty	**33%**	**64%**	**44%**
	Not Guilty	**67%**	**36%**	**56%**
Post- deliberation Group	Guilty	**17%**	**73%**	**22%**
	Not Guilty	**83%**	**27%**	**78%**
Post- deliberation Individual	Guilty	**17%**	**64%**	**33%**
	Not Guilty	**83%**	**36%**	**67%**

Examining the effect of group deliberation on individual verdict preference

A McNemar test using binomial distribution was used to examine whether individual pre- deliberation verdicts differed from individual post-deliberation verdicts. The McNemar test did not show a significant difference in the number of guilty verdicts between the pre-deliberation condition and the individual post-deliberation condition (N=32, exact p=0.25) (Table 2).

Table 2:

Comparison of Pre-Deliberation and Post-Deliberation Verdicts

	Guilty	Not Guilty
Pre-Deliberation Individual Verdict	**47%**	**53%**
Post-Deliberation Individual Verdict	**38%**	**62%**

Results summary

A significant association between the number of guilty verdicts and the type of evidence only was found in the group post-deliberation condition, with 73% of participants in the polygraph condition, 22% in the control condition and 17% in the fMRI condition reaching a guilty verdict. No significant effect of evidence type was found in either the individual pre-deliberation or individual post-deliberation conditions. There was also no significant difference found between the number of guilty verdicts in the individual pre-deliberation condition and the individual post-deliberation condition.

DISCUSSION

The current study examined the influence of fMRI lie detection evidence on jury decision making. Unlike previous research that mainly has examined individual juror verdicts in response to scientific evidence, the current study investigated the influence of neuroim-

aging evidence following post-trial deliberations. Hence, the emphasis of the study was not only on the influence of the fMRI evidence, but also the dynamics and effects of the deliberation process when considering fMRI evidence.

Examining the effect of deliberation on individual verdict preferences

It was hypothesised that the number of guilty verdicts in the pre-deliberation condition would be significantly different from the number of guilty verdicts in the individual post- deliberation condition. It was thought that the number of guilty verdicts would decrease following group deliberation, as biases and heuristic cues associated with the lie detection evidence would be eliminated. Previous research has shown that juror biases can be reduced as a result of group deliberation (Kaplan & Miller, 1978; Kerwin & Shaffer, 1994). However, in the current study, deliberations did not appear to alter individual juror's verdict preferences. Three explanations potentially can account for these findings. The first is that individual jurors already may have been utilising systematic processing prior to deliberation; the second explanation is that no bias exists in terms of lie detection evidence. The third is that engaging in group deliberations does not guarantee that individuals will adopt a different decision-making model that does not rely on heuristic processing.

However, the first two explanations are precluded by other findings in the current study where it was found that there was a significant association between the number of guilty verdicts and the type of lie detection evidence. While this indicates that there is some form of bias associated with lie detection evidence, this effect only was observed in the group post- deliberation condition. There was no significant association between the number of guilty verdicts and the type of evidence in either the pre-deliberation or the individual post-deliberation condition. These results indicate that different mechanisms underlie individual and group verdicts.

There are a number of different theories that account for the variation between individual and group verdicts as found in the current study. According to Kuhn and his colleagues (1994), juries are more likely than individual jurors to utilise the highly sophisticated Theory-Evidence Co-Ordination Model. The model asserts that during group deliberations, more evidence is available for consideration (Kalvin & Zeisel, 1966), resulting in alternative stories and scenarios being discussed. Prior to deliberation, some jurors potentially could have either forgotten or failed to consider the lie detection evidence. Deliberations could have rectified this. Deeper consideration of the lie detection evidence could have lead jurors to alter their initial verdict, resulting in a significant association between the number of guilty verdicts and the evidence condition. However, this model fails to account for the lack of association observed in the individual post-deliberation condition. If deliberations had succeeded in every juror employing the Theory-Evidence Co-Ordination Model, the effect of evidence should not have differed between the group post-deliberation verdict and the individual post-deliberation verdict.

This difference could be accounted for by social influence. Group Polarisation is a phenomenon whereby groups adopt a more extreme position in line with the views they had held prior to deliberation (Isenberg, 1986). Potentially this could result in increasing the

strength of the association between the number of guilty verdicts and the type of evidence, following deliberations. There are three ways in which group polarisation could have occurred: through the transfer of information, confidence and corroboration, or conformity (Sunstein, 2007). The results of the current study suggest that a number of participants sought conformity with the group in order to avoid conflict. This is illustrated by the fact that a significant effect only was observed in the group deliberation condition. If group deliberation had succeeded in altering a juror's verdict preference and them having adopted a different decision making process, there should have been a significant effect in the post-deliberation individual verdict. However, instead the post-deliberation individual verdict closely reflected the pre-deliberation individual verdict. This suggests that during group deliberation, social influence and social dynamic within the group is highly influential.

Comparing the impact of different scientific evidence on guilty verdicts

Although a significant association was found between the number of guilty verdicts and the type of evidence presented, the effect did not occur in the expected direction. In the current study, the polygraph evidence condition had the highest number of guilty verdicts, while the fMRI condition had the least. This is contrary to previous research, which has shown neuroimaging evidence, in particular fMRI evidence, to have a very persuasive effect on jurors and polygraph evidence to have little influence (McCabe et al., 2011; Myers, Latter, & Abdollahi-Arena, 2006). The results of the current study potentially could be accounted for by a lack of knowledge. Participants in the study may have possessed little knowledge regarding fMRI lie detection technology as it is a highly complex piece of scientific apparatus that has not been publicised highly within the UK. It has been found in previous research that participants, who reported being unfamiliar with forensic procedures, reported also being less confident in their judgements regarding forensic evidence (Smith, Patry, & Stinson, 2007). Individuals who are less confident in their understanding of the evidence may have more reasonable doubt, resulting in fewer convictions as demonstrated in the current study.

It is possible that cultural differences in how scientific evidence is portrayed and understood could account for the contrast between the results of the current study and previous research findings. Previous fMRI research largely has been conducted in the U.S. According to the Story Model (Pennington & Hastie, 1992), when deciding upon a verdict, jurors incorporate their own attitudes and experiences along with the case information. There are significant differences between the US and UK in relation to media depictions and portrayals of lie detection technology. In the US, this technology has received considerable exposure in popular media, often exaggerating the current state of the technology and its application (Wolpe et al., 2005).

For example, No Lie MRI is an American-based company that markets and sells fMRI lie- detection tests. The company proclaims that the technology is "the first and only direct measure of truth verification and lie detection in human history" (No Lie MRI, 2006). The company has had widespread press exposure. Within the US, there have been numerous news reports, documentaries, newspaper articles, magazine articles, and radio reports about

the company and fMRI technology. In contrast, within the UK, news reports and articles have been rare and reportage is comparatively neutral ("International Press Coverage," 2006)

Hence, people living in the US are more likely to have been exposed to positive media portrayals of fMRI lie detection technology and, according to Cultivation Theory (Gerbner, 1998), are more likely to possess schemas which reflect the media's overly optimistic stance. Individuals who have this schema are more likely to view fMRI lie detection evidence as reliable, giving it more weight than is warranted. These individuals are, therefore, more likely to reach a guilty verdict than those who do not possess this schema or bias. Individuals living in England are unlikely to possess this schema due to the lack of media attention fMRI lie detection technology has received. Due to the lack of media exposure, it is highly likely that the majority of people residing in England will have very little, if any, knowledge regarding fMRI lie detection technology. Thus, this could account for the high acquittal rate in the current study.

Conversely, individuals from the UK are more likely to be familiar with the polygraph than with fMRI lie detection technology. Polygraph testing is available widely across the UK, with major test centres in London, Manchester and Birmingham ("Polygraph Detector Testing," n.d.). The technology is also frequently in the media. Television talk shows, such as Jeremy Kyle and Trisha Goddard, often utilise the polygraph, but never are questions raised over the reliability of the device. This could account for the high percentage of guilty verdicts, observed in the current study, when polygraph evidence was presented. Participants may have viewed the lie detection evidence as more reliable than it is due to the media failing to identify the shortcomings of the technology. Again this could be considered an example of how television can potentially shape and cultivate perceptions of social reality. The British media appear to be creating a "special aura of certainty" (Lieberman et al., 2008, p. 32) in terms of the polygraph, similar to that which surrounds DNA evidence. Popular television programmes in the US also utilise the polygraph. Yet previous studies, such as the recent study conducted by McCabe et al (2011), found polygraph evidence to have little influence on juror verdicts. This could be due to television advertisings in the US advocating the use of fMRI. Companies advocating the use of fMRI technology inevitably will emphasise the limitations of the polygraph ("Polygraph Detector Testing", n.d.). Hence, these companies almost can be seen as assuming the role that an expert witness would have in court, albeit in an attempt to market their own product. In court, when scientific expert evidence is contradicted by an opposing expert, it is often considered by the jury as less influential (Greene, Johns, & Bowman, 1999). When fMRI companies are criticising the polygraph, this could potentially be altering, in a similar way to an opposing expert witness, individuals' perceptions of the technology, perceptions which may have been forged by television talk shows and other fictional dramas.

Limitations of the current study

As with any experimental study that attempts to emulate a complex real-life setting, it is important to acknowledge the limitations of the current study when interpreting the findings.

Researchers are unable to examine the decision-making process of real jurors deciding on real cases. Hence, the use of artificial decision-making tasks is required. However, this leads to issues when attempting to generalise the findings to real juries (Smith, Bull, & Holliday, 2011). The limitations of the current study are associated largely with the participant population, which was comprised almost entirely of University students. It is argued that student samples do not reflect actual jury pools as typically jury panels consist predominantly of community members (Fox, Wingrove, & Pfeifer, 2011). University students are claimed to differ from community samples in terms of age, education and marital status (Nuñez, Dahl, Tang, & Jensen, 2007). Despite these claims, an extensive review of the literature conducted by Bornstein (1999), found few differences between community and student samples. The sample size also may be considered as a limitation of the current. However, it is important to note that the study is a pilot project and provides a foundation for future research.

Future research directions

The current study is one of the first to directly compare the impact of fMRI and polygraph evidence on jury decision making. The results of the study largely contradict existing research, with the presentation of polygraph evidence resulting in a higher percentage of guilty verdicts than the presentation of fMRI evidence. It was suggested that juror's lack of familiarity in terms of fMRI could account for juror's largely favouring acquittal when this form of lie detection evidence is presented. This explanation potentially could prove to be an important avenue for future research. If the assumptions put forward by the current study are correct, it suggests that jurors may lack the ability to reason effectively about complex scientific evidence, evidence that may potentially be pivotal in establishing innocence or guilt. It is thus recommended that future research include a measure of jurors' understanding and awareness of different forms of lie detection technology.

The high conviction rates recorded with the presentation of polygraph evidence is an area that equally warrants further investigation. The findings of the current study suggest that the polygraph may have developed a special "aura of certainty" and "mystic fallibility" (Lieberman et al., 2008, p. 32), resulting in the polygraph itself having become a heuristic cue for jurors. It is proposed that such beliefs could stem from the media's portrayal of polygraph evidence. An important area for future research should be to explore how and if the media influences perceptions of lie detection evidence. It is essential to establish what knowledge individuals are gleaning from television, as if the assumptions put forward by the current study are correct, the media potentially could be having a huge impact on jury verdicts, creating significant biases. Hence, a possible and important area for future research could be the inclusion of a media exposure measure.

Another important element of the current study was the recording of verdicts at three separate time points. This allowed insight into the deliberation process which largely has been absent from previous jury decision-making studies. The current study found that individual juror verdicts can differ from group verdicts, and this was thought to be the result of social conformity. In order to closely emulate the decision-making process that occurs

in a real-life setting, it is thus recommended that future research should avoid examining individual juror judgements.

Conclusion

The current study was one of the first to explore the influence of fMRI lie detection evidence on jury decision making. It measured juror verdicts at three separate time points, a different approach to that often used within previous jury decision-making research. A significant effect in terms of the type evidence presented only was found in the group deliberation condition, suggesting that individual and group verdicts do differ. The findings of the current study indicate that this difference is largely the result of social influence. The study also found that the participants presented with the fMRI evidence largely favoured acquittal whilst those presented with polygraph evidence tended to favour conviction. Two explanations were provided to account for these findings. Ultimately, both explanations centre upon juror's lack of understanding in terms of complex scientific evidence. The first relates to an unwillingness to convict based upon a lack of understanding, and the second relates to reliance upon the media to provide the knowledge and understanding required to reach a verdict. The two explanations proposed by the paper suggest that jurors require additional training or information to allow them to reason about expert scientific evidence effectively. Although, it is beyond the scope of this paper to determine which of the two of the explanations is correct, the research has made a valuable contribution to the field of jury decision making and has provided a number of avenues for future research.

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