The CSI effect in Forensic Odontology. A systematic review

Nikolaos Christoloukas[1], Anastasia Mitsea[1]

[1] Department of Oral Diagnosis & Radiology, School of Dentistry, NKUA, Greece

Corresponding author: amitsea@dent.uoa.gr

The authors declare that they have no conflict of interest.

KEYWORDS

CSI effect,
CSI impact,
Forensic odontology,
Medicine,
Science

J Forensic Odontostomatol
2022. Aug;(40): 2-38:43
ISSN :2219-6749

ABSTRACT

The popularity of forensic science in recent decades is substantially related to the high rate of watching television programs dealing with the investigation of criminal cases, such as "CSI: Crime Scene Investigation" (CSI: Crime Scene Investigation, 2000) and the two sequels, "CSI: NY" (CSI: NY, 2004) and "CSI: Miami" (CSI: Miami, 2002). These medical-based TV series portrayed forensic science in a favorable way, encouraging viewers to experience differently this scientific field. Although it is considered a minor social phenomenon, the reality seems to diverge. The aim of this study is to systematically review the existing literature on the impact of the "CSI effect" on crime scene management, analysis, and interpretation of evidence on forensic odontology cases. Electronic research was attempted among four (4) different electronic databases from January 2005 to October 2021. After removing articles according to inclusion-exclusion criteria, the final selection resulted in 5 articles. The results indicated that forensic-based TV series provided a sense of plausibility not dependent on factual accuracy. In addition, an increasing pressure on law enforcement personnel and investigators to collect DNA at crime scenes, regardless of whether it was relevant to the case was also observed. The popularity of these TV shows has contributed to growing public interest in forensic science programs and hence the "CSI effect" had a greater impact on individuals who systematically watched such television series.

INTRODUCTION

As it is well known, television has a catalytic effect on shaping public opinion on various issues. So, in the 1990s, the popularity of medical-based television dramas enhanced public perception of health issues [1]. During the last decade, several TV series of crime or/ and legal dramas have been very popular worldwide [2,3]. Kim et al. (2009) referred to 33 U.S. television programs featuring forensic investigations and judicial proceedings commenting that, the abundance of information had almost become "part of the (popular) culture" [4].

Due to the growing dissemination of information concerning forensic science and criminal justice through crime television programs, there is a general perception that these series have dramatically influenced public beliefs about crime scene management and evidence's analysis and interpretation. In

particular, the public has raised high expectations and, in some cases, has been misleading concerning the management of real criminal cases [4-6].

The impact of crime television shows on the public perceptions of collection, management, analysis, and interpretation of forensic evidence has been dubbed the "CSI effect (Crime Scene Investigation effect)", a term that began to appear in the mainstream media as early as 2004. Although it is considered a minor social phenomenon, the reality seems to be different [5]. The research question posed was "Does the SCI effect has an impact on forensic odontology cases?" This study aims to systematically review the existing literature on the impact of the "CSI effect" on crime scene management, analysis, and interpretation of evidence in forensic odontology cases.

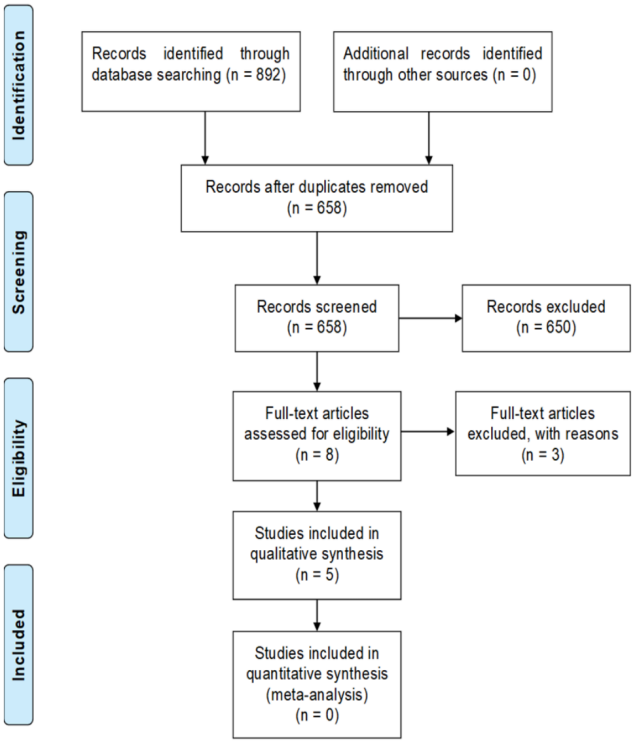
MATERIAL AND METHODS

A systematic review of literature on the influence of the "CSI effect" and its utilization in forensic dental evidence was conducted. The search strategy and inclusion of the studied articles was based on the PRISMA (Preferred Reporting Items for Systematic Review and Meta-Analyses) statement published in 2020 [7]. Electronic research was attempted of the 'SCOPUS', 'COCHRANE Library', 'PUBMED' and 'Web of Science' databases from January 2005 to October 2021 using the search terms,''CSI Effect and impact'' OR ''CSI Effect and impact and forensic Odontology'' OR ''CSI Effect and impact and forensic medicine" OR "CSI Effect and impact and forensic science. Abstracts were examined for relevance to the defined review question. Full texts of case reports, technical notes, in vitro and experimental studies on humans in English were included. Newsgroup articles, systematic reviews, letters to the editor, animal experimental studies in a language other than English were excluded. Two researchers independently reviewed each abstract and title for potential relevance to the research question. Articles included by either researcher were subjected to full-text screening. At the full-text screening stage, the researchers reviewed the full text of each article for inclusion, and disagreements were resolved by discussion between them.

RESULTS

The database search resulted in 892 articles. After removing duplicate records (n=234), as well as full texts that were not available or did not agree with the inclusion criteria, the selection finally resulted in 5 articles as presented in Fig.1. Of the five articles identified, three reported data from adult population, jury-eligible participants [8-9], one reported data from volunteers aged from 13-43 years old [11],

Figure 1. PRISMA Flow Diagram



one reported data derived from the transcripts' content analysis of the first six seasons of CSI [1]. Only two out of five articles reported participants' very high degree of confidence in DNA testing [1,9]. Of the five articles identified, two articles provided the view that watching CSI series and other forensic crime shows usually contains exaggeration and conveys a sense of plausibility that did not depend on the accuracy/absence of facts[8,11]. No systematic reviews or high-level evidence studies were identified in this review. The articles finally included in this review were published between 2012 and 2019, as shown in Table 1.

Table 1. Articles included in this systematic review

Year	Authors	Title	Country	Material	Journal
2012	Ley et al	Investigating CSI: Portrayals of DNA testing on a forensic crime show and their potential effects	Unite Kingdom	Transcripts of first six (6) of CSI	Public Understand. Sci.
2019	Ribeiro et al	Beliefs about error rates and human judgment in forensic science	Australia	On-line questionnaire	Forensic Sci. Int
2013	Chan	An investigation into the CSI effect on the Malaysian population	Malaysia	Self-administered form (on-line)	Australian Journal of Forensic Sciences
2019	Slak et al	Do Fictional Forensic and Criminal Investigation Television Shows Influence Students' Enrollment Decisions?	Slovenia	On-line questionnaire	Journal of Criminal Justice Education
2012	Smith & Bull	Identifying and measuring juror pre-trial bias for forensic evidence: development and validation of the Forensic Evidence Evaluation Bias Scale	United Kingdom	10-item scale questionnaire (on-line)	Psychology, Crime & Law

DISCUSSION

In this review, an extensive survey of previous literature on forensic evidence and the "CSI effect" among four different electronic databases was attempted. The "CSI effect" involves the growing expectation that crime scenes will reveal forensic evidence that can be scientifically analyzed through forensic science and technology expertise, such as DNA testing, fingerprint or bitemarks analysis, and which could be supported in court[12]. The collection and use of forensic data are very significant for criminal investigations and

prosecutions[13] because these procedures contribute to identifying the essential elements of a crime, to determining the guilt or innocence of the persons involved at the scene of the crime[14]. Of the five articles identified, three articles suggested that watching crime series (such as CSI: New York - CSI: Miami – NCIS – BONES - Forensic Heroes 3 (FH3)) forensic techniques (DNA testing and genetics in general) sometimes portrayed in more equivocal or complex ways [1,8,11]. Especially, Ribeiro et al. (2019) assessed their sample's responses about forensic techniques and concluded that people did not blindly believe that these scientific procedures were highly accurate[8]. Their sample consisted of 101 Australian adults (age range 20 to 70 years) recruited by an Australian market research company (December 2015) and remunerated $5.95 AUD for their involvement. Individuals completed an online questionnaire (on their own computers or electronic devices) in which they were required to rate their general knowledge of forensic procedures and their expectations of the accuracy of each stage on a percentage scale. Their responses were processed with the Qualtrics survey software and correlated each other using a) single sampled t-test, b) Pearson's correlations (r). The respondents had varying convictions about the accuracy of different forensic techniques and believed that forensic science's process involved a significant amount of human judgment and was relatively prone to errors. Although the authors' article revealed very limited support for the CSI effect, however, participants considered forensic dentistry as the procedure with the highest accuracy (89,26%) with almost similar results to DNA analysis (89,95%) [8].

Chan (2013) investigated Malaysian viewers' expectations of forensic science who were influenced by the knowledge obtained from watching a particular forensic-themed drama series [Forensic Heroes 3 (FH3)] [11]. Their sample consisted of 131 participants (age range 13 to 43 years) who submitted an online form filled with their responses and sent it back either by e-mail or via the Facebook electronic platform. The questionnaire form comprised general questions for volunteers and thirty-four (34) items that could be graded on a scale of 1 to 5 (1= strongly disagree, 5 = strongly agree), covering five (5) main conduct; s categories: general belief, forensic scientists, and the profession, conduct, and ethics, forensic laboratory, forensic evidence, and investigation. The participants were divided into three groups: cohort 1 (n=65), who were definitely affected by the particular TV forensic–
based show (FH3), cohort 2 (n=47) who had not watched the selected TV program, and cohort 3 (n=19) consisting of forensic science professionals who would discern the outcome's impact. Statistical processing was performed using Minitab 15 (software program) and the statistically significant difference between the selected groups was assessed using the Mann-Whitney U test. The results demonstrated that CSI effect's influence between the three (3) cohorts was insignificant. The belief of solving all cases was more pronounced in the first cohort and viewing specific forensic-themed programs presented a false reality characterized by hyperbole [11].

In the study by Ley et al. (2012), it was found that CSI forensic-based series portrayed a sense of plausibility not dependent on factual accuracy or their absence. The authors evaluated scripts of 51 randomly selected episodes of the first six seasons of CSI. They focused on the different stages of DNA collection, analysis and utilization. Each examiner/coder determined on a percentage scale whether the CSI investigator: a) searched for DNA in unknown sources at the crime scene (66%), b) collected or stored at least one DNA sample from a known individual or animal (52%), c) compared at least one DNA sample with possible samples from a federal DNA database (29%), d) solved the case (88%). Although, there are a few limitations of this study's results. The subcategories' grading is subjective and based solely on coders' judgment, whose level of experience did not mentioned in the article. Additionally, they reported an extremely high rate of case resolution when adopting DNA analysis, and this has resulted in increased pressure on law enforcement officials and investigators to collect DNA at crime scenes, regardless of whether it is relevant to the case [1].

Slak et al. (2019) aimed to examine whether viewing's frequency of forensic and criminal investigative TV series had any impact on students' enrolment at the Faculty of Criminal Justice and Security (FCJS) at the University of Maribor [9]. Their sample consisted of 151 first-year students of FCJS who answered an online questionnaire. The survey's sample had a higher percentage of females than the Slovenian

population and was not selected randomly. The online form included questions about their initial source of knowledge regarding investigative work if they watched specific series that influenced their final choice to enroll in FMJS school, how the police were portrayed in specific series and basic demographic information. Their results revealed the complexity of viewing specific forensic and investigative TV programs as influential behavioral factors. All statistical assessment methods (Kruskal-Wallis H/ Kolmogorov-Smirnov/Shapiro-Wilk tests) demonstrated that viewing TV forensic-based series and films did not overly strong motivators for the first-year student. Specific statistical tests (Kolmogorov-Smirnov and Shapiro-Wilk) verified that participants' responses were highly dispersed and did not follow a normal distribution. Additionally, the authors considered the "CSI effect" as a useful educational factor, although further future research is needed to examine the effect where many questions remained unsettled [9].

Smith and Bull (2012) aimed to develop a more precise predictor of pre-trial jury bias that focuses on the interpretation of forensic evidence [10]. In the initial stage of their survey, participants [jury-eligible psychology postgraduate students, (N=219)] were requested to grade thirty-one items from an initial pool, according to some basic jury eligible criteria described by the Criminal Justice System for England and Wales (www.cjsonline.gov.uk). Participation in the research was advertised through various websites and via the authors' institution press office. Initially, the questionnaire's results were tabulated in Excel data and exported to SPSS (statistical package) for analysis. Items with correlations less than 0,3 (n=21) were excluded. The final version of the scale consisted of 10 items with sufficiently high inter-item and item-total correlation scores (greater than 0.3). At the second stage of the survey, 159 jury-eligible undergraduate psychology students at the researchers' university participated in exchange for partial course credit. The final sample consisted entirely of undergraduate students while the sample's majority (88%) was female population. Individuals rated the 10-item Forensic Evidence Evaluation Bias Scale (FEEBS) using a 5-point Likert scale (coded as 1-5). They also studied a fictional murder trial presented by the authors and were asked to evaluate the defendant's likelihood of being guilty of the crime (expressed as a percentage) and a final verdict (guilty/innocent). Their results showed that the DNA evidence was rated significantly stronger than all other evidence types and overall 46% of the final sample (73 participants) voted guilty while 86 individuals voted not guilty (54%). There are a few limitations considering the results of this article[10].

Of the five articles identified, three articles supported the opinion of watching forensic-based TV shows provided a sense of plausibility [8,9,11]. Their results are consistent with Nisbet et al.'s claim (2002), who demonstrated that such viewing was negatively related to the self-perceived understanding of DNA evidence and these learning opportunities can be displaced [15]. Slak et al. (2019) mentioned the CSI effect's usefulness as an educational tool, however watching systematically these TV series was not a determining factor in enrolment's final choice [9].

The most affected population group was the viewers, whose expectations were clearly higher than those of professionals and non-viewers, who considered that at least one error occurred at each stage of the forensic science process. Due to the topic's specificity, the articles' total number for assessing was low while existed a high degree of heterogeneity in terms of the results and in sample collection methods. More future research is needed to examine the "CSI effect" on forensic odontology cases applying more relevant evaluation and sample collection methods.

The studies included in this systematic review did not referred exclusively to dental data and presented heterogeneity in their sample and data collection and evaluation. Smith and Bull (2012) assessed the responses of their sample, which consisted of undergraduate students at the researchers' university whose participation was rewarded in exchange for partial course credit, influencing their judgment. Chan (2013) included underaged participants in his survey [11]. The sample of Slak et al. (2019) survey was not randomly selected and not representative of the Slovenian population as it focused exclusively on first-year students, while the "CSI effect" may have a greater impact on older age groups [9]. Ley et al. (2012) assessed DNA testing's usefulness as a stage of forensic science and not the "CSI effect" overall. Furthermore, they did not report their examiners' level of experience.

Due to the aforementioned heterogeneity and the lack of a sufficient number of decent quality primary studies, a meta-analysis was impossible to performed.

CONCLUSIONS

It seems that the "CSI effect" had a greater impact on individuals who systematically watched such television series and created unrealistic expectations about the cases-solving procedure. Non-viewers of TV forensic-based series and forensic scientists were not affected to the same extent. All participants evaluated DNA evidence as to the most significantly stronger than other types of evidence in forensic science. Therefore, an increasing pressure on law enforcement personnel and investigators to collect DNA at crime scenes, regardless of whether it was relevant to the case was also observed. Further research concerning the CSI effect is needed, in order to identify and reduce the impact of unscientific parameters on the management, evaluation and judicial use of forensic evidence.

REFERENCES

1. Ley BL, Jankowski N, Brewer PR. Investigating CSI: Portrayals of DNA testing on a forensic crime show and their potential effects. Public Understanding of Science. 2012;21(1):51-67. doi:10.1177/0963662510367571
2. Durnal EW. Crime Scene Investigation (as Seen on TV). Forensic Science International 2010; 1–5. doi:10.1016/j.forsciint.2010.02.015.
3. Kruse C. Producing absolute truth CSI science as wishful thinking, American Anthropologist 2010; 79–91.
4. Kim YS, Barak G, Shelton DE. Examining the 'CSI-Effect' in the Cases of Circumstantial Evidence and Eyewitness Testimony: Multivariate and Path Analyses. Journal of Criminal Justice 2009; 37: 452–60. doi:10.1016/j.jcrimjus.2009.07.005.
5. Hui CYT, Lo TW. Examination of the 'CSI Effect' on Perceptions of Scientific and Testimonial Evidence in a Hong Kong Chinese Sample. International Journal of Offender Therapy and Comparative Criminology 2017; 61:819 – 33. doi:10.1177/0306624X15611874.
6. Ewanation LA, Yamamoto S, Monnink J, Maeder. Perceived realism and the CSI-effect. Cogent Social Sciences 2017;3(1):1294446, Available form: https://doi.org/10.1080/23311886.2017.1294446
7. Page MJ, McKenzie JE, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, Shamseer L,Tetzlaff JM, Akl EA, Brennan SE, Chou R, Glanville J, Grimshaw JM, Hrobjartsson A, Lalu MM, Li T, Loder EW, Mayo-Wilson E, McDonald S, McGuinness LA, Stewart LA, Thomas J, Tricco AC, Welch VA, Whiting P, Moher D. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. BMJ. 2021 29;372:n71. doi:10.1136/bmj.n71.
8. Ribeiro G, Tangen JM, McKimmie BM. Beliefs about error rates and human judgment in forensic science. Forensic Sci Int. 2019;297:138-147. doi: 10.1016/j.forsciint.2019.01.034.
9. Slak B, Erčulj VI, Areh I, Dobovšek B. Do Fictional Forensic and Criminal Investigation Television Shows Influence Students' Enrollment Decisions? Journal of Criminal Justice Education. 2020;31(1):23-42.
10. Smith LL and Bull R. Identifying and measuring juror pre-trial bias for forensic evidence: development and validation of the Forensic Evidence Evaluation Bias Scale. Psychology, Crime & Law. 2012;18(9):797–815.
11. Chan K-W. An investigation into the CSI effect on the Malaysian population. Australian Journal of Forensic Sciences. 2013;45(4):417–30.
12. Holmgren JA, Fordham J. The CSI Effect and the Canadian and the Australian Jury. Journal of Forensic Science 2011;63-71.doi:10.1111/j.1556-4029. 2010. 01621.x.
13. McEwen T, The Role and Impact of Forensic Evidence in the Criminal Justice System, Final Report, National Institute of Justice, 2011.
14. Fisher, Barry AJ. Techniques of Crime Scene Investigation. 7th ed. Boca Raton, FL: CRC Press; 2004.
15. Nisbet MC, Scheufele DA, Shanahan J, Moy P, Brossard D, Lewenstein BV. Knowledge, reservation, or promise? A media effects model for public perceptions of science and technology. Communication Research 2002; 29: 584-608.