Promega

Spectrum Compact CE System

Sanger Sequencing and Fragment/STR Analysis

- benchtop 4-capillary electrophoresis instrument for 4-, 5- and 6-dye chemistries and up to 32 samples in a single run
- compatible with a broad range of commercial chemistries for DNA sequencing, forensic STR profiling, MLPA, MSI and many more
- flexible raw data analysis
- prefilled, plug-and-play consumables for maximal flexibility and efficiency
- controlled by the integrated touchscreen or by Remote Access Software
- on-site instrument and software installation, operational and application trainings

www.promega.com/spectrum-compact-system

Spectrum
COMPACT
CE SYSTEM

Received: 20 March 2021 | Accepted: 19 July 2021

DOI: 10.1111/1556-4029.14854

JOURNAL OF FORENSIC SCIENCES

LETTER TO THE EDITOR

Authors' Response to Tse et al Commentary on

See Original Dror et al Article *here*
See JFS Editor-in-Chief Preface *here*
See Tse et al Commentary on *here*

Editor,

In their Letter to the Editor, Tse et al. raised concerns about our data analyses and requested clarifications about both the death certificate data and the experimental data. Below, we provide additional information and analyses to assuage their concerns and further examine the validity of our conclusions [1].

First, as per the death certificate data, Tse et al. suggested that our finding of a difference in real-world manner of death determinations between Black and White children (χ^2 (1) =4.02, $p < 0.05$, OR =1.81 [95% CI: 1.01, 3.25]) may have been confounded by sex, age, or cause of death. This is a reasonable question because if our comparison groups differed along multiple dimensions, it would limit our ability to attribute our findings to the child's race *per se*.

Further analysis of the death certificate data examines all of these alternative explanations:

1. Our samples of Black and White children did not differ in terms of sex (54.3% and 58.6% male, respectively), $\chi^2(1) = 1.82$, $p = 0.178$ (see Table 1).
2. Our samples of Black and White children also did not differ in terms of age (*M*s =2.08 & 2.19, *SD*s =1.31 & 1.39, respectively), $t(1064) = 1.25$, $p = 0.212$ (see Table 2).
3. With respect to cause of death, Tse et al. speculated that rates of "blunt force head injury" may have differed between groups. In response, we tallied the number of children whose deaths were ruled as accidents or homicides and whose certificates noted "blunt force" and/or "head trauma." From this, we found that such injuries were equally common in Black (38.8%) and White (34.0%) children, $\chi^2(1) = 0.53$, $p = 0.466$.
4. Tse et al. also questioned whether rates of "perinatal death" differed between Black and White children—but that too was not the case: There were no children in our sample who died before age 1 and whose deaths were ruled as accident or homicide.
5. Beyond the above analyses requested by Tse et al., we took it upon ourselves to further examine the death certificate data for other potential cause of death confounds. After "blunt force" and/or "head trauma", the next-most common causes of death were asphyxia and drowning. Analyses of these likewise showed that these factors were equally common in Black and White children—Asphyxia: 31.3% vs. 27.0% ($\chi^2(1) = 0.46$, $p = 0.496$) and drowning: 11.3% vs. 14.5% ($\chi^2(1) = 0.48$, $p = 0.491$).Second, Tse et al. also expressed concerns about our experimental data. They argued that although the majority of our participants (58.6%) did not make a determination, we did not include those data in our analysis.

Our null hypothesis was that there would be no difference in the frequency of "homicide" and "accident" determinations between the "Black" and "White" scenarios. We conducted the appropriate data analysis to test this hypothesis, and we found a statistically significant and strong effect, $\chi^2(1) = 15.89$, $p < 0.0001$, *OR* =12.14 [95% CI: 3.23, 45.68].

Nevertheless, as suggested by the Letter to the Editor, we performed the additional analysis that included the undetermined decision data (i.e., a 2×3 rather than 2×2 contingency table—using the first three columns rather than only the first two—see Table 3). The results of this analysis, $\chi^2(2) = 15.90$, $p < 0.001$, further confirmed our results and conclusions [1].

Tse et al. also criticized our "assumption" that natural and suicide were not realistic manner of death responses in our experiment, adding that the validity of such an assumption is "debatable." We would like to clarify that although we found it extremely implausible that a 3.5 year-old child would commit suicide or that the injuries described are consistent with a natural death of a 3.5 year-old child, we nonetheless presented our participants with all the five manner of death options (i.e., accident, homicide, natural, suicide, or undetermined). Our data show that none of the 133 participants chose natural or suicide as the manner of death.

TABLE 1 Black and White children did not differ in terms of sex

	Male	Female
Black	195 (54.3%)	164 (45.7%)
White	414 (58.6%)	292 (41.4%)

TABLE 2 Black and White children did not differ in terms of age

	0–1	1–2	2–3	3–4	4–5	5–6
Black	2 (0.6%)	172 (47.9%)	68 (18.9%)	56 (15.6%)	34 (9.5%)	27 (7.5%)
White	2 (0.3%)	322 (45.5%)	145 (20.5%)	88 (12.4%)	77 (10.9%)	73 (10.3%)

TABLE 3 Overall analysis that included all possible decisions

	Possible Decisions				
	Homicide	Accident	Undetermined	Natural	Suicide
Black	23 (35.4%)	4 (6.2%)	38 (58.4%)	0 (0%)	0 (0%)
White	9 (13.2%)	19 (27.9%)	40 (58.9%)	0 (0%)	0 (0%)

All of these requests for further analysis were reasonable, and we were happy to provide these additional analyses and clarifications. However, Tse et al. also suggested that our statistical analysis should have compared the rates of "determined vs. undetermined" manners of death responses.

It is proper to do an analysis that includes the "undetermined" responses of the participants, which we did above. However, it makes no sense or is it appropriate to analyze contrived responses that were not even possible to make in our study. The participants were not asked to judge whether they can "determine" or "not determine" the manner of death. Twisting their actual responses in this way and analyzing—as the Letter suggests—"determined" (a nonpossible response) vs "undermined" is not only uninformative in that it does not address our research question, but it is also an unjustified distortion of the data about the participants' actual decisions.

In sum, all of the aforementioned supplemental analyses of both the death certificate data and the experimental data further confirm and strengthen our original conclusions [1]. It is not a surprise that cognitive bias impacts forensic pathology decisions; such impact has been shown time and again in medical diagnoses (e.g., [2,3]), in forensic science decisions [4], as well as in many other domains [5]. It is puzzling why anyone would think that forensic pathology decisions would be any different.

Itiel E. Dror PhD[1]
Judy Melinek MD[2]
Jonathan L. Arden MD[3]
Jeff Kukucka PhD[4]
Sarah Hawkins JD[5]
Joye Carter MD, PhD[6]
Daniel S. Atherton MD[7]

[1]*University College London, London, UK*
Email: i.dror@ucl.ac.uk
[2]*PathologyExpert Inc, San Francisco, CA, USA*
[3]*Arden Forensics, PC, McLean, VA, USA*
[4]*Department of Psychology, Towson University, Towson, MD, USA*
[5]*Clark County Public Defender's Office, Las Vegas, NV, USA*
[6]*Sheriff/Coroner Division at San Luis Obispo Count-California, San Luis Obispo, CA, USA*
[7]*Department of Pathology, University of Alabama at Birmingham, Birmingham, AL, USA*

ORCID
Itiel E. Dror https://orcid.org/0000-0003-4866-209X
Jeff Kukucka https://orcid.org/0000-0002-2692-7803

REFERENCES

1. Dror IE, Melinek J, Arden JL, Kukucka J, Hawkins S, Carter J, et al. Cognitive bias in forensic pathology decisions. J Forensic Sci. 2021. https://doi.org/10.1111/1556-4029.14697. Epub 2021 Feb 20.
2. Anderson KO, Green CR, Payne R. Racial and ethnic disparities in pain: Causes and consequences of unequal care. J Pain. 2009;10(12):1187–204. https://doi.org/10.1016/j.jpain.2009.10.002.
3. FitzGerald C, Hurst S. Implicit bias in healthcare professionals: A systematic review. BMC Med Ethics. 2017;18(1):19. https://doi.org/10.1186/s12910-017-0179-8.
4. Cooper GS, Meterko V. Cognitive bias research in forensic science: A systematic review. Forensic Sci Int. 2019;297:35–46. https://doi.org/10.1016/j.forsciint.2019.01.016.
5. Kahneman D, Sibony O, Sunstein CR. Noise: A flaw in human judgment. Glasgow, Scotland: William Collins Publishers; 2021.