SUPERIOR COURT OF NEW JERSEY
APPELLATE DIVISION
DOCKET NO. A-002069-21T4

STATE OF NEW JERSEY,	:	CRIMINAL ACTION
Plaintiff-Appellant,	:	On Appeal From a Final Order of the Superior Court of New Jersey, Law Division, Middlesex County
v.	:	
DARRYL NIEVES,	:	Indictment No. 17-06-00785
Defendant-Respondent.	:	Sat Below:
	:	Hon. Pedro J. Jimenez, Jr., J.S.C.

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BRIEF ON BEHALF OF THE STATE OF NEW JERSEY

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PRELIMINARY STATEMENT

Abusive Head Trauma (AHT) is a medical diagnosis that has been recognized as valid by professional medical societies, government agencies, and organizations around the world, including the American Academy of Pediatrics, the American Society of Pediatric Neuroradiology, the European Society of Paediatric Radiology, the Japanese Pediatric Society, the Centers for Disease Control, and the World Health Organization. It is a diagnosis that has been found reliable and admissible as a subject of expert testimony in published opinions of courts in numerous jurisdictions across the United States and overseas.

Despite an overwhelming international consensus of medical experts and jurists who accept AHT as a valid diagnosis, the trial court in this case decided that AHT is a diagnosis based on "junk science" and barred a medical expert in child abuse pediatrics – a pediatrician who examined the victim in this case – from testifying about her diagnosis of AHT at defendant's trial. On the basis of this erroneous ruling, the trial court then dismissed defendant's indictment for assaulting and endangering the welfare of his infant son, finding that without testimony on AHT, the State could not prove defendant caused his son's injuries, which included severe retinal hemorrhages in both eyes and bleeding on his brain. The trial court's orders are contrary to science and law and must be reversed.

STATEMENT OF PROCEDURAL HISTORY

Middlesex County Indictment No. 17-06-00785-I, filed June 30, 2017, charged defendant, Darryl Nieves, with second-degree aggravated assault under N.J.S.A. 2C:12-1(b)(1) (Count One) and second-degree endangering the welfare of a child under N.J.S.A. 2C:24-4(a)(2) (Count Two). (Pa1).[1]

On July 2, 2018, defendant moved for a hearing pursuant to N.J.R.E. 104(a) and N.J.R.E. 702, also known as a Frye[2] hearing, to determine the admissibility of testimony regarding the diagnosis of abusive head trauma (AHT), previously known as "shaken baby syndrome" (SBS). (Pa7). The Honorable Pedro J. Jimenez, J.S.C. (the trial court), granted the motion on November 2, 2018. (Pa7).

On July 11, 2019, the State moved for reconsideration of the trial court's November 2, 2018 decision. (Pa7). Judge Jimenez granted the State's reconsideration motion and denied

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[1] References to the record are made as follows:
Pa = State's appendix.
1T = Transcript of motion, Nov. 2, 2018.
2T = Transcript of hearing, Jul. 11, 2019.
3T = Transcript of hearing, Aug. 12, 2019.
4T = Transcript of Frye hearing, Sept. 24, 2020.
5T = Transcript of Frye hearing, Sept. 29, 2020.
6T = Transcript of Frye hearing, Sept. 30, 2020.
7T = Transcript of Frye hearing, Oct. 13, 2020.
8T = Transcript of Frye hearing, Oct. 15, 2020.
9T = Transcript of decision, Jan. 7, 2020.
10T = Transcript of hearing, Jan. 28, 2022.

[2] Frye v. United States, 293 F.3d 1013 (D.C. Cir. 1923).

defendant's motion for a Frye hearing by order dated September 11, 2019. (Pa7).

Defendant filed a motion for leave to appeal from Judge Jimenez's September 11, 2019 order, and the Appellate Division remanded for a Frye hearing by order dated October 29, 2019. (Pa79).

The Frye hearing was conducted on five dates in September and October 2020. (4T-8T).

On January 7, 2022, Judge Jimenez issued a written decision and order granting "a defense motion to bar the admission of testimony concerning "Shaken Baby Syndrome/Abusive Head Trauma." (Pa2-78).[3] Immediately after Judge Jimenez announced the court's decision on AHT testimony, the State requested a stay of the decision. (9T8-6 to 14). Judge Jimenez denied the request for a stay and scheduled the next court date for January 28, 2022. (9T9-3 to 4; 9T10-14 to 22; Pa80). The judge also invited and received an oral application by defense counsel to dismiss the indictment and told the parties no briefs would be needed to address that motion. (9T5-23 to 8-19).

[3] The January 7, 2022 written decision and order were served on the parties by email. Although date-stamped "01/07/2022," they were not uploaded to eCourts until January 31, 2022. The final version of the written decision, which the State has provided for this appeal (Pa2-78), contains technical corrections and stylistic edits to the initial version.

Defense counsel filed a written motion to dismiss on January 12, 2022. (Pa81-82). The State filed a response to that motion on January 20, 2022. (Pa83-84).

On January 27, 2022, the State filed a motion for reconsideration of the order barring AHT testimony. (Pa85). On January 28, 2022, after hearing limited argument, Judge Jimenez denied the State's reconsideration motion and dismissed the indictment. (10T; Pa86-87).

On February 11, 2022, Judge Jimenez signed and filed a judgment of dismissal and issued an order expunging the record of defendant's prosecution. (Pa88-91). On February 23, 2022, the judge issued another order, which vacated the expungement order for the purpose of allowing the State to pursue this appeal. (Pa91-92).

On March 14, 2022, the State filed a notice of appeal challenging the dismissal of the indictment and the preclusion of testimony on which the dismissal was based. (Pa118-22). The State also filed a motion for leave to appeal and a motion to file the motion for leave to appeal as within time, having been advised that defendant would argue the State could not challenge the order barring AHT testimony without leave to appeal from that order. (Pa123-24). Defendant moved to dismiss the State's appeal on March 18, 2022. (Pa125).

On April 1, 2022, this court denied defendant's motion to dismiss the State's appeal and granted the State's as-within-time motion and motion for leave to appeal "to the extent necessary," having "determined that the State's notice of appeal properly incorporates the earlier interlocutory order barring testimony." (Pa123-25).

STATEMENT OF FACTS

On February 15, 2017, detectives from the Middlesex County Prosecutors Office were assigned to assist with an investigation regarding an allegation of physical abuse to a child, D.J.[4] (Pa97). D.J., who was eleven months old at the time, had been admitted to St. Peter's University Hospital on February 10, 2017, with multiple injuries. (Pa100).

Detectives spoke with defendant, who indicated that he was alone with D.J. on the date D.J. was taken to the hospital. (Pa97). Dr. Gladibel Medina, MD, Medical Director of the Dorothy B. Hersh Regional Child Protection Center, also interviewed defendant and [redacted] D.J.'s mother. (Pa108). Dr. Medina reported that defendant regularly cared for D.J. (Pa109) and was caring for D.J. during each of three recent separate medical emergencies. (Pa116). Both Ms. [redacted] and defendant denied ever hurting D.J. (Pa111).

[4] The State uses a pseudonym to protect the privacy of the child-victim. See R. 1:38-3(c)(9).

In a report dated April 26, 2017, and detailing D.J.'s medical history, Dr. Medina explained that D.J. had sustained injury to his brain as well as retinal hemorrhaging. (Pa100). Dr. Medina reported that D.J. had been admitted to the hospital on February 10, 2017, "for altered mental status after his parents noted he had stiffening of his arms and legs and was unresponsive." (Pa100). D.J. "was found to have subacute on chronic subdural hemorrhages and numerous multilayered retinal hemorrhages in both eyes." (Pa100).

Based on the information available through D.J.'s medical records and her interviews with defendant and D.J.'s mother, Dr. Medina made a "diagnosis of Child Physical Abuse . . . , specifically abusive head trauma, as occurs with a shaking event with or without impact." (Pa117). Dr. Medina made that diagnosis "within a reasonable degree of medical certainty." (Pa117). After consulting with Dr. Medina, on February 15, 2017, detectives charged defendant with assaulting and endangering the welfare of D.J. (Pa93-99).

At the Frye hearing, Dr. Medina was qualified without objection as an expert in the fields of pediatrics and child abuse pediatrics. (4T26-8 to 13). She testified about AHT generally and about her diagnosis of AHT in this case.

First, Dr. Medina testified that AHT is defined by the Centers for Disease Control (CDC) "as an inflicted injury of the

skull or intracranial contents in an infant or a child under five years caused by violent shaking, blunt head impact or a combination of both." (4T26-18 to 25). She described "the spectrum of injuries associated with" AHT, which can include "injury to the intracranial structures," such as "the brain, the vasculature inside the skull," and "the eye inside the globe, specifically the retina." (4T27-11 to 28-11). When asked what presenting or observable symptoms raise suspicion for possible AHT, Dr. Medina identified the most common presenting symptom as being "altered mental status reflecting an insult going on inside the CNS, which is the central nervous system." (4T27-25 to 28-11). The doctor testified that "external bruises or physical injuries that you can see" are less common presenting symptoms. (4T27-25 to 28-11). The doctor noted that shaking with impact against a soft surface could cause AHT with "no external signs of trauma." (5T52-25 to 53-14).

Dr. Medina explained that concern about possible AHT may be raised if a child shows symptoms of trauma but no trauma is indicated in the medical history provided to the examining physician. (4T28-12 to 25). However, a diagnosis of AHT is made only after the child undergoes a physical examination and the examining physician consults with practitioners in "multiple subspecialties in the field of pediatrics and also trauma." (4T29-8 to 25). Doctors in those subspecialties include "a

hematologist, radiologist, ophthalmologist," and sometimes a geneticist. (4T30-1 to 4). There is also "a comprehensive evaluation of the medical history," including the child's behavior and demeanor immediately prior to the presentation of symptoms and the child's usual state of health. (4T29-9 to 16).

The goal is "to conduct a comprehensive evaluation of other possible findings that might be coexisting with the external presentation, and evaluation of possible pathology or medical issues that might be contributing to the presentation and any other findings observed." (4T29-17 to 25). A child abuse pediatrician then reviews the "history of the child, the medical history, the physical findings, the laboratory tests, the imaging studies" in order to "put a picture together and determine the nature of the concerns." (4T29-9 to 16).

Dr. Medina reviewed the 160-year history of AHT as a diagnosis. (4T30-16 to 32-18). The doctor noted that the diagnosis was formerly known as "shaken baby syndrome," but in 2009, the American Academy of Pediatrics began using the broader term "abusive head trauma" to account for all mechanisms of inflicted injury, including not only shaking but impact and crushing as well. (4T31-11 to 32-14).

Dr. Medina testified that AHT is generally accepted as a valid diagnosis within the medical community. (4T32-19 to 33-5). Specifically, the doctor testified that the diagnosis "is

accepted by all the pediatric subspecialties involving intracranial injury, which are general pediatrics, pediatric ophthalmology, pediatric neurology, pediatric neurosurgery, pediatric radiology, [and] pediatric neuroradiology." (4T32-19 to 33-5). She cited the following national and international societies as having recognized AHT as a valid diagnosis:

> the American Academy of Pediatrics, the American Academy of Ophthalmology, the American Academy of Pediatric Ophthalmology and Strabismus, the Royal College of Ophthalmology, the Royal College of Pediatrics and Child Health, the Norwegian, Japan and Swedish Pediatric Societies, the American and European Societies for Radiology and Neuroradiology, the Latin American Society for Pediatric Regulatory, the American Professional Society for the Abuse of Children, the CDC, and the World Health Organization.
>
> [4T33-12 to 34-6.]

Dr. Medina acknowledged that there is some debate among biomechanists regarding whether shaking alone can generate sufficient force to cause certain injuries associated AHT, namely retinal hemorrhages and subdural hematomas. (4T129-5 to 24). The doctor clarified, however, that "[t]here is no debate in the medical community" about whether shaking alone can cause those injuries. (4T132-17).

Regarding retinal hemorrhages, Dr. Medina testified that "the retinal hemorrhages that are observed in inflicted injury

are very different with a very different pattern that only motor vehicle roll-overs or other certain medical conditions have been associated with it. Very few." (4T55-19 to 23). That pattern "is specific to inflicted head injury when all else has been taken into consideration and ruled out." (4T68-11 to 14). The doctor also noted, "In terms of the how we see subdural hemorrhages in the different trauma presentations, most are associated with inflicted injury and less common with accidental injury." (4T55-5 to 8).

Dr. Medina cited studies showing a strong association between severe retinal hemorrhages, subdural bleeding, and AHT caused by shaking with or without impact. (4T58-22 to 72-9). The doctor clarified, however, that an AHT diagnosis is not made based on the presence of any one of these symptoms or any combination of them. (4T72-10 to 15). The diagnosis is only made after a comprehensive, multidisciplinary evaluation that takes into account the child's history and all other possible causes of the child's symptoms. (4T72-17 to 73-23).

Turning to how she diagnosed AHT in this case, Dr. Medina testified she first became involved in D.J.'s case on February 15, 2017, five days after D.J. was admitted to the hospital. (4T80-24 to 82-13). It had been reported that D.J. "went limp" during a diaper change on February 10, 2017, and had two other similar episodes during the prior two weeks. (4T82-1 to 17).

It was believed that D.J. had experienced seizures, so he was evaluated by the hospital's neurology staff. (4T82-11 to 17).

D.J.'s CT scan raised concern because it revealed "subacute and chronic subdural hemorrhages," which are not normally caused by seizures. (4T82-18 to 23). D.J. was evaluated by hospital staff to find "any other potential abnormalities." (4T82-24 to 25). An ophthalmological exam "revealed severe multi-layered retinal hemorrhages on both eyes." (4T83-1 to 3). At that point, the hospital contacted the Department of Child Protection and Permanency (DCP&P) and Dr. Medina "to assist in the evaluation of this case." (4T83-2 to 5).

Dr. Medina recounted her next steps as follows:

> [O]nce the subdural and the retinal bleeding was identified, I reported to the treating medical team, once I met with the parents and evaluated the patient, that the child needed to have a comprehensive metabolic evaluation looking for a metabolic condition that potentially could be associated with subdural bleeding and retinal hemorrhages. That would be conducted by a geneticist. In addition, because of the bleeding abnormalities, the child required a full hematological consultation to ensure that he didn't have any underlying coagulation issues that could facilitate or account for the findings of retinal bleeding and subdural blood in this case.
>
> [4T83-13 to 25.]

D.J. was given a video encephalogram (EEG), which records electrical activity in the brain. (4T84-13 to 18). The EEG

showed "no clinical indications of seizures," and Dr. Medina noted that no seizures were observed by hospital staff during D.J.'s three-week hospitalization. (4T84-18 to 23).

Dr. Medina reviewed D.J.'s medical records, which were extensive because his birth was extremely premature, and "he was hospitalized for the first six to seven months of his life." (4T87-12 to 23). Although eleven months old, D.J. "was at the developmental stage of a three- to four-month old." (4T97-1 to 2). However, outside of the timeframe between February 3 and 10, 2017, D.J. "was a pretty healthy baby." (4T97-1 to 16).

The evaluation of D.J.'s case continued with follow-up appointments and testing in the weeks following his discharge from the hospital. (4T97-15 to 98-9). The tests conducted, the medical records reviewed, and the information gathered from D.J.'s parents revealed no metabolic disorder or other underlying condition that explained D.J.'s subdural hemorrhages, severe retinal hemorrhages, and "sudden altered mental status during diaper changes only" between February 3 and 10, 2017. (4T98-12 to 99-3). In addition, D.J.'s "parents denied any history of accidental trauma." (4T97-11 to 14). After every other possible explanation was ruled out, Dr. Medina diagnosed D.J. with AHT, meaning "some kind of inflicted trauma" to D.J.'s head. (4T98-12 to 99-15; 5T52-25 to 53-14; 5T68-19 to 69-21). That diagnosis was based on not only medical literature but also

the doctor's own training and experience, and it was made "within a reasonable degree of medical certainty." (4T99-25 to 100-2; 5T55-13 to 19).

After Dr. Medina testified at the Frye hearing, defendant presented the testimony of three witnesses who were qualified as experts in their respective fields: Dr. Joseph Scheller, who was qualified as an expert in pediatric neurology and neuroimaging; Dr. Julie Mack, who was qualified as an expert in radiology and pediatric radiology; and Dr. Chris Van Ee, who was qualified as an expert in biomechanics. (5T111-1 to 2; 6T24-18 to 20).

Dr. Scheller acknowledged that AHT "is widely accepted in various disciplines, including [his] own field of neurology, and neurosurgery" and that his own views on AHT represent approximately a five-percent minority of the medical community. (8T3-18 to 5-17). The doctor did not disagree that "violent shaking can cause injuries to a baby," but he opined that there was no study showing that "a human can shake a baby causing the triad of injuries."[5] (8T54-21 to 23). Dr. Scheller criticized Dr. Medina's report for failing to mention chronic hygroma as a possible cause of D.J.'s symptoms but conceded that he did not actually know whether Dr. Medina had considered that alternative

[5] In the context of discussions regarding AHT, "the triad" refers to "[s]ubdural hemorrhages, severe retinal hemorrhages and any neurological presentation, known as encephalopathy. Which can be unresponsiveness, apnea, seizures, altered mental status." (4T53-7 to 12).

theory. (8T27-21 to 28-7). Dr. Scheller also conceded that he had never examined D.J., talked to D.J.'s parents, consulted with any of the radiologists or neurologists at St. Peter's University Horpital, or consulted with a child abuse pediatrician in reaching his opinions about this case. (8T32-22 to 33-10).

Dr. Mack opined that D.J.'s diagnostic imaging suggested he had benign enlargement of the subarachnoid space (BESS), noting that she found no direct evidence of traumatic brain injury. (6T87-1 to 88-14). However, Dr. Mack acknowledged that she had only reviewed D.J.'s imaging and "a couple of pieces of medical records," not all of D.J.'s medical records, in forming her opinion. (6T105-3 to 108-19). Dr. Mack also acknowledged that "abuse can result in brain hemorrhage." (6T126-22 to 23).

Dr. Van Ee testified generally about biomechanical studies related to AHT but not about the facts of this case. (7T100-15 to 17). He testified that he was unaware of any biomechanical study proving that subdural hematomas and retinal hemorrhages in an infant could be caused by shaking alone. (7T54-6 to 13). Dr. Van Ee admitted, however, that biomechanical studies related to AHT have limitations and that those studies had also failed to disprove that shaking alone could cause subdural hematomas and retinal hemorrhages. (7T100-18 to 109-24).

LEGAL ARGUMENT

POINT I

THE TRIAL COURT MISAPPLIED N.J.R.E. 702 AND THE FRYE TEST IN BARRING EXPERT TESTIMONY ON ABUSIVE HEAD TRAUMA (AHT) AS UNRELIABLE; THE STATE PROVIDED AMPLE EVIDENCE OF THE DIAGNOSIS'S GENERAL ACCEPTANCE IN THE RELEVANT SCIENTIFIC COMMUNITY. (Pa2-78).

A diagnosis that is widely accepted as valid by professional medical societies and organizations around the world has been dismissed by Judge Jimenez as "junk science." (Pa72). Despite being presented with detailed expert testimony, voluminous medical literature, and numerous judicial opinions establishing the general acceptance of the AHT diagnosis and its underlying methodology in the medical community, Judge Jimenez found that testimony regarding AHT was too unreliable to be admissible and "far more prejudicial than probative in value." (Pa77).

Judge Jimenez reasoned as follows:

> [N]o one has ever tested the capacity of an individual to shake a baby in an effort to cause the triad of symptoms defining AHT. Human babies are very different from the monkeys, wooden dolls, or other anthropomorphic surrogates utilized in the studies referenced and reviewed concerning the effects of force and impact. As a result, and as testified by Dr. Medina on behalf of the State, we do not know nor will we likely ever know what is the minimum force necessary to cause subdural hematomas or any of the other triad symptoms making up

> AHT as there is no scientific technique or procedure to confirm AHT a reliable diagnosis.
>
> [Pa72.]

In reaching this conclusion, Judge Jimenez disregarded the studies presented by the State in which individuals had admitted to shaking infants and those infants had exhibited the "triad" of symptoms associated with AHT. (4T68-25 to 72-9; Pa277-95, 341-45). As a result of this and other errors, the judge barred the State from offering any testimony regarding AHT at defendant's trial. (Pa77).

The trial court's order barring AHT testimony resulted from the court's misapplication of N.J.R.E. 702 and the Frye test, which govern the admission of expert testimony. This erroneous ruling, which led the trial court to compound its error by dismissing the indictment, must be reversed.

Notably, defendant had only challenged the reliability and general acceptance of testimony that shaking alone can cause the "triad" of symptoms associated with AHT. (Pa448). Nevertheless, the trial court's decision includes broad statements about AHT in general like the following: "AHT has never been medically nor scientifically validated as a diagnosis because it has never been developed through scientific/medical techniques or procedures . . . ." (Pa71). By that statement's reasoning, AHT is not a reliable diagnosis, even where there

appears to have been shaking accompanied by impact, because any AHT diagnosis is based on a flawed methodology. That opinion is contrary to the Frye hearing testimony and even inconsistent with defendant's position before the trial court. (Pa448). Such statements exemplify the trial court's misunderstanding of the AHT diagnosis and underscore the need to correct the court's error, lest other courts adopt this fallacious reasoning.

Under N.J.R.E. 702, "[i]f scientific, technical, or other specialized knowledge will assist the trier of fact to understand the evidence or to determine a fact in issue, a witness qualified as an expert by knowledge, skill, experience, training, or education may testify thereto in the form of an opinion or otherwise." The rule imposes three requirements:

> (1) the intended testimony must concern a subject matter that is beyond the ken of the average juror;
>
> (2) the subject of the testimony must be at a state of the art such that an expert's testimony could be sufficiently reliable; and
>
> (3) the witness must have sufficient expertise to explain the intended testimony.
>
> [State v. Harvey, 151 N.J. 117, 169 (1997) (quoting State v. Kelly, 97 N.J. 178, 208 (1984)).]

"Those requirements are construed liberally in light of Rule 702's tilt in favor of the admissibility of expert testimony." State v. Jenewicz, 193 N.J. 440, 454 (2008). Here, the trial

court found that Dr. Medina's testimony regarding AHT would meet the first and third requirements but took issue with the second requirement: reliability. (Pa70).

New Jersey courts apply the test enunciated in Frye, 293 F.3d at 1013, to assess the reliability of expert testimony. "The test requires trial judges to determine whether the science underlying the proposed expert testimony has 'gained general acceptance in the particular field in which it belongs.'" State v. J.L.G., 234 N.J. 265, 280 (2018) (quoting Frye, 293 F.3d at 1014).

"[W]hen a trial court applies the Frye test to admissibility determinations, an appellate court should employ a de novo standard of review." In re Commitment of R.S., 339 N.J. Super. 507, 531 (App. Div. 2001), aff'd, 173 N.J. 134 (2002). This court recently explained why that standard, rather than an abuse-of-discretion standard, is employed: "While the trial court is in a better position to shape the record and make credibility determinations, appellate courts can digest expert testimony as well as review scientific literature, judicial decisions, and other authorities." State v. Rochat, 470 N.J. Super. 392, 436 (App. Div. 2022) (internal quotation marks omitted) (quoting State v. Torres, 183 N.J. 554, 567 (2005)). The Rochat court continued,

> The appellate court should carefully review the relevant authorities in determining the correctness of the decision to admit or exclude the disputed testimony. In short, the appellate court need not be as deferential to the trial court's ruling on the admissibility of expert scientific evidence as it should be with the admissibility of other forms of evidence.
>
> [Ibid. (quoting Torres, 183 N.J. at 567).]

The Rochat court also observed that an appellate court reviewing a trial court's decision under Frye need not consider only those publications that were available to the trial court. See ibid.

> In the rapidly changing world of modern science, continuing research may affect the scientific community's acceptance of a novel technology. By reviewing posttrial publications, an appellate court can account for the rapid pace of new technology. The continuing review also recognizes that general acceptance may change between the time of trial and the time of appellate review.
>
> [Ibid. (quoting Harvey, 151 N.J. at 167-68).]

General acceptance under Frye can be demonstrated through "expert testimony, authoritative scientific and legal writings, and judicial opinions." J.L.G., 234 N.J. at 281. Only one of those methods must be employed, not all three. See State v. Dishon, 297 N.J. Super. 254, 276 (App. Div. 1997) (citing Kelly, 97 N.J. at 210) (emphasis added) ("Kelly holds that in order to introduce expert testimony in a new field of scientific inquiry,

the proponent bears the burden to establish its 'general acceptance' and thereby its reliability, through one of three methods . . . ."). As our Supreme Court has explained,

> [t]he Frye test recognizes that most judges are experts in few, if any, fields of scientific endeavor. Judges are not well suited to determine the inherent reliability of expert evidence, but they can decide whether the proffered evidence has gained "general acceptance" in the scientific community. The proponent of expert evidence can therefore meet his burden by demonstrating that the testimony has achieved enough acceptance in the scientific community to convince the court that it is reasonably reliable.
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> State v. Cavallo, 88 N.J. 508, 521 (1982).

Significantly, our courts have emphasized that

> [p]roof of general acceptance does not mean that there must be complete agreement in the scientific community about the techniques, methodology, or procedures that underlie the scientific evidence. Nor does it require complete agreement over the accuracy of the test or the exclusion of the possibility of error. Thus, the party proffering the evidence need not show infallibility of the technique nor unanimity of its acceptance in the scientific community. [T]he State's burden is to prove that the . . . test and the interpretation of its results are non-experimental, demonstrable techniques that the relevant scientific community widely, but perhaps not unanimously, accepts as reliable.
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> [Rochat, 470 N.J. Super. at 435-36 (internal quotation marks and citations omitted).]

Our courts have similarly noted that "it is commonplace in our courtrooms for juries to hear conflicting expert opinions regarding the precise significance of scientific tests," State v. Marcus, 294 N.J. Super. 267, 287 (App. Div. 1996), and that "[e]xpert testimony should not be excluded merely because it fails to account for some condition or fact that the opposing party considers relevant." State v. Dreher, 302 N.J. Super. 408, 464 (App. Div.), certif. denied, 152 N.J. 10 (1997). "For scientific evidence to be admissible, [courts] only require that the scientific technique or procedure be accepted as scientifically reliable, not that it produce results which are beyond all legitimate debate." Marcus, 294 N.J. Super. at 287.

"Every scientific theory has its detractors." Harvey, 151 N.J. at 171. "The court's function is to distinguish scientifically sound reasoning from that of the self-validating expert, who uses scientific terminology to present unsubstantiated personal beliefs." Dreher, 302 N.J. Super. at 464 (quoting Landrigan v. Celotex Corp., 127 N.J. 404, 414 (1992)).

Those are the principles that guide our courts in applying the Frye test, and the trial court here followed none of them. Although only obligated to present expert testimony, judicial opinions, or medical literature demonstrating AHT's general acceptance as a diagnosis, the State presented all three. Judge

Jimenez nevertheless found that AHT is not a reliable diagnosis, dismissed it as "akin to 'junk science'" (Pa72), and barred the State from presenting any testimony regarding AHT at defendant's trial. The judge's ruling directly contravenes the evidence presented at the Frye hearing.

A. The State established AHT's general acceptance as a diagnosis through expert testimony.

Dr. Medina, who was qualified as an expert in pediatrics and child abuse pediatrics, testified that AHT and the process used to diagnose it are generally accepted as valid within the medical community. (4T32-19 to 34-14; 4T41-2 to 7; 4T73-24 to 74-9; 4T128-15 to 21). The doctor cited numerous scientific professional organizations that accept the validity of AHT as a diagnosis, including the American Academy of Pediatrics and the Centers for Disease Control (CDC). (4T33-12 to 34-6). Dr. Medina cited not only American organizations but international ones as well, including the Royal College of Pediatrics and Child Health and the World Health Organization (WHO). (4T33-20 to 34-2).

Judge Jimenez did not question the credibility of Dr. Medina's testimony. On the contrary, the judge wrote of all the experts who testified, "They each brought years of experience, observation, and study to the assessment of AHT as a routine diagnosis. Each expert based their opinions on authoritative,

scientific literature [that] had been published and/or peer reviewed." (Pa70).

Moreover, defendant's own experts did not dispute that the medical community generally accepts AHT as a valid diagnosis. (6T103-22 to 105-2; 7T86-19 to 22; 8T3-18 to 5-17). Dr. Scheller, in particular, testified that AHT "is widely accepted in various disciplines, including [his] own field of neurology, and neurosurgery" and qualified his own contrary opinions on AHT as representing a five-percent minority view within the medical community. (8T3-18 to 5-17). The State therefore established through the expert testimony at the Frye hearing that AHT as a medical diagnosis "has 'gained general acceptance in the particular field in which it belongs.'" J.L.G., 234 N.J. at 280 (quoting Frye, 293 F.3d at 1014).

B. The State established AHT's general acceptance as a diagnosis through authoritative scientific and legal writings.

In addition to Dr. Medina's expert testimony, the State offered "authoritative scientific and legal writings," ibid., establishing that the AHT diagnosis and its underlying methodology are generally accepted as valid in the medical community. Those writings included a 2018 "Consensus statement on abusive head trauma in infants and young children" supported by the American Academy of Pediatrics and the American Society

of Pediatric Neuroradiology among other societies. (Pa130-33; Pa138-55). The State also cited a law journal article by Dr. Sandeep Narang, M.D., J.D., entitled "A Daubert Analysis of Abusive Head Trauma/Shaken Baby Syndrome." 11 Hous. J. Health L. & Pol'y 505 (2011) (Narang I). (Pa130-34). In that article, the author, who is both a medical doctor and a lawyer, assesses the reliability of AHT as a diagnosis under the standard that federal courts use to assess the reliability of expert testimony, which is the standard set forth in Daubert v. Merrell Dow Pharms., Inc., 509 U.S. 579 (1993), see J.L.G., 234 N.J. at 280. Narang I at 505-08. Dr. Narang concludes that the AHT diagnosis and its underlying methodology satisfy the Daubert standard. Narang I at 576-83. Narang also addresses arguments commonly used to attack the validity of AHT as a diagnosis, including one of the claims raised by defendant's experts in this case (5T133-23 to 136-8; 6T60-7 to 61-1; 6T96-9 to 19), which is that the medical literature on AHT suffers from "circular reasoning." Narang at 561-62.[6]

The State also cited numerous studies supporting the validity of the AHT diagnosis and its underlying methodology. The significance of these studies was discussed by Dr. Medina in

[6] A study published after the Frye hearing in this case further addresses the "circular reasoning" criticism. See Stephen C. Boos et al., Traumatic Head Injury and the Diagnosis of Abuse: A Cluster Analysis, 149 Pediatrics e2021051742 (2022). (Pa583-94).

her testimony. (4T35-6 to 72-9). Among the studies cited by the State and discussed by Dr. Medina were one led by Matthieu Vinchon and another led by Catherine Adamsbaum. Matthieu Vinchon et al., Confessed Abuse Versus Witnessed Accidents in Infants: Comparison of Clinical, Radiological, and Ophthalmological Data in Corroborated Cases, 26 Child's Nervous Sys. 637 (2010) (Frye Hearing Exhibit S-10) (Pa287-95); Catherine Adamsbaum et al., Abusive Head Trauma: Judicial Admissions Highlight Violent and Repetitive Shaking, 126 Pediatrics 546 (2010) (Frye Hearing Exhibit S-9) (Pa277-86). (4T68-25 to 71-9).

In the Vinchon study, the authors compared the head injuries found in children in cases of corroborated inflicted head injury (IHI) with those found in cases of corroborated accidental trauma (AT). (Pa288). "Corroborated AT was defined as an accident having occurred in a public space in front of independent witnesses. Corroborated IHI was defined as abuse confessed by the perpetrator." (Pa288). As highlighted by Dr. Medina, the Vinchon study showed that the presence of subdural hemorrhages (SDH) had a 68% positive predictive value[7] for IHI,

[7] "'Positive predictive value' is the proportion of patients who have positive test results and actually have the disease or condition. This value is very important in diagnostic testing as it reflects the probability that a positive test reflects the underlying condition being tested." Narang I at 538.

the presence of severe retinal hemorrhages (RH) had a 96% positive predictive value for IHI, and the absence of external signs of trauma to the head had an 83% positive predictive value for IHI. (Pa287; 4T69-21 to 70-6). "[T]aking all three into consideration, the specificity[8] was 100 percent for inflicted head injury." (Pa287; 4T70-2 to 4). Moreover, "the sensitivity[9] was only 24.4%" (Pa287), and thus many children who actually suffered IHI did not present with all three features (SDH and RH combined with the absence of external signs of trauma). The authors concluded, "Our study confirms the high diagnostic value of RH, SDH, and signs of impact for the differential diagnosis between AT and IHI. The evaluation of head injuries in infants requires a high level of awareness and thorough and systematic examination by a trained multidisciplinary team." (Pa287).

The authors of the Adamsbaum study also examined cases of confessed IHI but focused specifically on cases in which one or more acts of violent shaking were confessed. (Pa277). "For the purposes of this study, 'confession' was defined as the

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[8] "'Specificity' is the probability that a test for disease will give a negative result when the patient does not have the disease." Narang I at 538 (internal quotation marks omitted).

[9] "'Sensitivity' is the probability that a test for a disease will give a positive result when the patient actually has the disease. Put simply, it is actually the chance the condition will be found by the test." Narang I at 538 (internal quotation marks omitted).

admission by a perpetrator of a causal relationship between the violence inflicted and the child's symptoms." (Pa284). Detailed confessions were given in the cases of 29 children. (Pa278). SDH were present in all 29 children, as that was a criterion for inclusion in the study. (Pa278). However, Tables 1, 2, and 3 of the article show that 24 of the children, or 82.7%, also had retinal hemorrhages, and 19 of them, or 65.5%, also had seizures at the time AHT was diagnosed. (Pa280-81, 283). The authors noted, "[o]ne of the most important points in this article is the role of shaking in the etiology of these injuries. . . . This unique series of confessions confirms the pathogenic nature of shaking in and of itself, even without final impact." (Pa284) (emphasis added).

Another study highlighted in Dr. Medina's testimony is one led by Suzanne P. Starling, MD, which also examined cases of admitted shaking with and without impact. Suzanne P. Starling et al., Analysis of Perpetrator Admissions to Inflicted Traumatic Brain Injury in Children, 158 Archives Pediatrics & Adolescent Med. 454 (2004) (Frye Hearing Exhibit S-19) (Pa341-45). (4T71-10 to 72-9). The authors of that study similarly found that "[c]hildren who were reportedly shaken appeared similar to those who were reportedly both shaken and impacted or impacted alone." (Pa344). Referring to AHT as "inflicted traumatic brain injury (ITBI)," the authors concluded, "The

symptoms of inflicted head injury in children are immediate. Most perpetrators admitted to shaking without impact. These data, combined with the relative lack of skull and scalp injury, suggest that shaking alone can produce the symptoms seen in children with ITBI." (Pa341).

The authors of the Vinchon, Adamsbaum, and Starling articles all recognized reliance on perpetrator admissions as a limitation of their studies. (Pa284, 292, 344). The authors of the Adamsbaum study acknowledged "that perpetrator admissions are not scientific evidence." (Pa284). They nevertheless emphasized that that perpetrator admissions "provide information that is invaluable to our understanding." (Pa284).

The Vinchon, Adamsbaum, and Starling studies are undoubtedly authoritative scientific writings that demonstrate the reliability of the methodology underlying an AHT diagnosis. Those studies, along with the other medical literature cited by the State before the trial court (4T35-6 to 72-9; Pa138-55, 160-345) and Dr. Narang's analysis of AHT under the Daubert standard, Narang I, constituted "authoritative scientific and legal writings," J.L.G., 234 N.J. at 281, that established the general acceptance of AHT as a valid diagnosis in the medical community.

C. The State established AHT's general acceptance as a diagnosis through judicial opinions.

Having presented expert testimony and "authoritative scientific and legal writings," ibid., the State cited numerous published judicial opinions from this jurisdiction and others that established even more firmly the general acceptance of AHT as a valid diagnosis.

In opposing defendant's motion for a Frye hearing, the State cited among other opinions this court's opinion in State v. Compton, 304 N.J. Super. 477 (App. Div. 1997). (Pa539-36; 1T6-4 to 8-15). There, the court considered whether the general acceptance of AHT, then known as "Shaken Baby Syndrome," had been established by expert testimony, "authoritative scientific and legal writings," or judicial opinions. Id. at 484-85 (quoting Kelly, 97 N.J. at 210). The court concluded, "All three means are available here to qualify Shaken Baby Syndrome as a fitting subject for expert testimony." Id. at 485.

Addressing judicial opinions in particular, the Compton court noted that "numerous other jurisdictions have accepted [Shaken Baby Syndrome] as a reliable scientific premise." Id. at 486-87 (alteration in original). The court observed that some jurisdictions have accorded AHT "[e]xplicit judicial recognition" and that "[m]any more courts, including our own Supreme Court in State v. Galloway, 133 N.J. 631, 638 (1993),

have recognized the condition implicitly, by acknowledging expert testimony describing the syndrome in connection with a particular case at bar, or treating it as an accepted medical condition without further comment." Id. at 486-87 (collecting cases).

Following the Frye hearing in this case, the State cited cases collected in Narang I in which "courts, U.S. and international, have concluded that AHT is a generally accepted valid medical diagnosis." Narang I at 580 n.513 (citing "People v. Martinez, 74 P.3d 316, 323 (Colo. 2003) ('[W]e assume, as it is not in dispute, that the scientific principles of shaken-impact syndrome and subdural hematomas resulting from extreme accidents are reasonably reliable'); State v. McClary, 541 A.2d 96, 102 (Conn. 1988) (shaken baby syndrome is generally accepted by medical science); State v. Torres, 121 P.3d 429, 437 (Kan. 2005) (testimony by physicians that infant's injuries were shaken baby syndrome, and not consistent with falling off a chair was sufficient for conviction of felony murder); State v. Leibhart, 662 N.W.2d 618 (Neb. 2003) (expert testimony on shaken baby syndrome admissible; passes Daubert); Order Denying Motion to Exclude Testimony on AHT/SBS at 5, State v. Mendoza, No. 071908696 (Utah Dist. Ct., June 5, 2009) ('[T]he State's experts made a very compelling . . . showing that SBS is both still widely accepted and applicable to the current case'); see also R

v. Harris, [2005] EWCA (Crim) 1980, [267] (Eng.); R v. Henderson; R v. Butler; R v. Oyediran, [2010] EWCA (Crim) 1269, [7] (Eng.)"); Narang I at 586 n.533 (citing "United States v. Vallo, 238 F.3d 1242, 1245 (10th Cir. 2001); People v. Dunaway, 88 P.3d 619, 633-34 (Colo. 2004);" and "State v. Glenn, 900 So.2d 26, 34-35 (La. Ct. App. 2005)"). (Pa131). Defendant, by contrast, cited only one judicial opinion in which AHT testimony was not admitted: an unpublished Law Division decision. (Pa519). "Unreported Law Division opinions have neither controlling nor precedential value." Viviani v. Borough of Bogota, 336 N.J. Super. 578, 587 (App. Div. 2001) (citing R. 1:36-3), rev'd on other grounds, 170 N.J. 452 (2002).

Thus, the State presented the trial court with far more than a sufficient number of judicial opinions establishing the general acceptance of AHT as a valid diagnosis.

D. The reasons cited by the trial court do not justify exclusion of Dr. Medina's testimony.

Judge Jimenez ruled that "testimony concerning AHT cannot be allowed in this case because it is not reliable evidence and is far more prejudicial than probative in value." (Pa77). This erroneous finding resulted from numerous flaws in the court's reasoning.

First, Judge Jimenez reasoned that "AHT is more conjecture than a diagnosis because it is an option embraced once a

diagnostician runs out of diagnostic options." (Pa71). This statement suggests that a diagnosis made through a process of elimination is not reliable. However, a diagnosis made through a process of elimination is a differential diagnosis, and our Supreme Court has "conclude[d] that a trial court may admit an expert's differential diagnosis into evidence." Creanga v. Jardal, 185 N.J. 345, 355-57 (2005). Thus, the trial court erred in finding that AHT is not a reliable diagnosis because the diagnosis is reached through a process of elimination.

"In assessing the methodology in AHT, it is important to remember that arriving at the diagnosis of AHT employs no different methodology than arriving at any other clinical diagnosis. At its core, clinical medical decision-making is grounded in the roots of the scientific method." Narang I at 583. "[T]he methodology physicians employ in coming to the diagnosis of AHT is no different from the methodology physicians employ in arriving at any medical diagnosis — it is the differential diagnosis methodology." Sandeep K. Narang, M.D., J.D., et al., A Daubert Analysis of Abusive Head Trauma/Shaken Baby Syndrome — Part II: An Examination of the Differential Diagnosis, 13 Hous. J. Health L. & Policy 203, 289 (2013) (Narang II at 289). "Stedman's Medical Dictionary defines 'differential diagnosis' as 'the determination of which of two or more diseases with similar symptoms is the one from which the

patient is suffering, by a systematic comparison and contrasting of the clinical findings.'" Narang II at 302 (quoting Stedman's Medical Dictionary (28th ed. 2006)).

In Narang II, the authors cite several examples of other medical diagnoses where, as in an AHT diagnosis, there may be inconsistency between a patient's reported medical history "and objective medical data and the differential diagnosis methodology is also employed in arriving at that diagnosis." Id. at 314. The authors highlight the example of "[t]he diagnosis of bulimia nervosa," which is "'binge eating and inappropriate compensatory methods to prevent weight gain.'" Ibid. (quoting Am. Psychiatric Ass'n, Diagnostic and Statistical Manual of Mental Disorders 589 (4th ed., text revision 2000)).

> A key component of the diagnosis is the patient's denial of the purging behavior, but with manifest physical signs or lab tests indicating the diagnosis. . . . As with any other medical condition, there are other conditions on the differential diagnosis to consider prior to arriving at the diagnosis. . . . It is the physician's task to consider these other disorders on the differential and order the appropriate labs and imaging prior to ruling them out before arriving at the bulimia nervosa diagnosis.
>
> [Id. at 314-15.]

The authors noted, "There is no question that bulimia nervosa is a valid diagnosis, or that a physician can reliably arrive at

that diagnosis using the differential diagnosis methodology." Id. at 315.

The same methodology is used when AHT is diagnosed, see Narang I at 541-58 (discussing the differential diagnosis as applied to SDH and RH), and it is no less reliable when it leads to a diagnosis of AHT. The same diagnostic process of elimination may result in AHT being ruled out as the cause of a child's symptoms. There is no basis in law or medical science for the trial court's opinion that "AHT is more conjecture than a diagnosis." (Pa71).

Judge Jimenez also applied an incorrect legal standard regarding expert medical testimony that is admissible at a criminal trial. The court stated, "The evidentiary standard for a hypothesis proven to a reasonable degree of medical certainty falls short of the evidentiary standard employed to determine guilt in a criminal trial." (Pma76). However, as the New Jersey Supreme Court observed in State v. Denofa, "[m]edical opinion testimony is not rendered with certainty, but with reasonable certainty." 187 N.J. 24, 45 (2006) (citing State v. Fortin, 178 N.J. 540, 597 ("An expert offering scientific opinion testimony must do so within a reasonable degree of certainty or probability.")). Indeed, this court not merely permits but requires that medical testimony be rendered according to that standard. See State v. Howard-French, 468

N.J. Super. 448, 465-66 (App. Div.) (quoting Johnesee v. Stop & Shop Cos., 174 N.J. Super. 426, 431 (App. Div. 1980)) ("[M]edical-opinion testimony must be couched in terms of reasonable medical certainty or probability; opinions as to possibility are inadmissible."), certif. denied, 248 N.J. 592 (2021).

In Denofa, the State's medical expert opined based on the victim's injuries that she died as a result of being thrown from a bridge. Id. at 45. The Court took no issue with the testimony of the State's expert and upheld the defendant's murder conviction. Id. at 48. Denofa illustrates that expert medical testimony rendered to a reasonable degree of certainty may be admissible at even the most serious of criminal trials.

Like some legal scholars who have challenged the AHT diagnosis, Judge Jimenez "fallaciously confounded standards for diagnostic sufficiency with standards for criminal conviction sufficiency." Narang II at 291. Contrary to Judge Jimenez's reasoning, Dr. Medina's testimony regarding the diagnosis of AHT generally and in this case would not fail to meet the evidentiary standard applicable at a criminal trial.

The trial court also disregarded compelling evidence in deciding to exclude testimony AHT testimony. Judge Jimenez wrote, "[N]o study has ever validated the hypothesis that shaking a child can cause the triad of symptoms associated with

AHT." (Pa71). However, in making this statement, the trial court disregarded the aforementioned studies presented by the State involving cases of confessed shaking, which even critics concede "support the hypothesis that isolated traumatic shaking can give rise to the triad." Göran Elinder et al, Traumatic shaking: The role of the triad in medical investigations of suspected traumatic shaking, Report No. 255E 27 (2016) (the SBU Report) (Frye Hearing Exhibit S-8) (Pa138-55, 233, 277-95; 4T43-15 to 44-5; 4T68-23 to 72-9).

Notably, although the authors of the Vinchon, Adamsbaum, and Starling articles all recognized reliance on perpetrator admissions as a limitation of their studies (Pa284, 292, 344), a systematic review of studies of AHT confessions was published in 2020, and the results support the both the reliability of such confessions and the conclusion that shaking alone can cause the symptoms associated with AHT. See George A. Edwards et al., What Do Confessions Reveal About Abusive Head Trauma? A Systematic Review, 29 Child Abuse Rev. 253 (2020) (Pa550-65).

The authors reached several significant conclusions: (1) "despite scepticism by some regarding the role of shaking in AHT, this comprehensive systematic review clearly shows that confessions of AHT occur across different regions of the world, and that shaking alone is the most commonly reported mechanism of injury;" (2) "shaking with or without impact accounts for

over 80 per cent of the confessed mechanisms. Despite concern that investigation and the judicial process can lead to false confessions, we found no evidence that confessions during those circumstances were more likely to include shaking than those given during medical evaluation;" and (3) "the notable similarities in the description of shaking in confessions, regardless of country or circumstance, emphasise the significance of shaking in AHT; moreover, these similarities clearly refute the argument that there are insufficient data within the published literature to support shaking as an important cause of AHT." (Pa561).

The Edwards study underscores both the value of the Vinchon, Adamsbaum, and Starling studies and the trial court's error in disregarding them. See also Kent P. Hymel et al., An analysis of physicians' diagnostic reasoning regarding pediatric abusive head trauma, 129 Child Abuse & Neglect 105666 (2022) (reporting on a study similar to Vinchon's and noting, "The similarity of our results to those of Vinchon et al. is particularly noteworthy given that the studies were conducted on different continents, by different investigators, in different time periods, and in different health care systems. Replicability is a hallmark of science."). (Pa572).

A study published in 2021, after the Frye hearing in this case, provides further proof that shaking alone can cause the

"triad" of symptoms associated with AHT. The authors, led by Dr. Kenneth W. Feldman, MD, "acquired a case series of independently witnessed shaking without reported impact events to determine whether shaking could cause acute neurological findings alone or with intracranial and retinal injuries typical of AHT." Kenneth W. Feldman, et al., Abusive head trauma follows witnessed infant shaking, Child Abuse Rev. e2739 (2022), available at https://doi.org/10.1002/car.2739. (Pa541). The study describes "10 cases of independently witnessed shaking without evidence of impact (on witness statements, clinical examination, radiology and autopsy), which resulted in symptoms and/or clinical and radiologic signs of AHT." (Pa547).

The authors stated, "All 10 infants we reported with neurological symptoms sustained those symptoms as AHT manifestations following independently witnessed infant shaking. Half of those 10 infants also sustained radiologic intracranial injuries and RHs typical of AHT." Those intracranial injuries included SDH. (Pa545). "All reported infants lacked historical and clinical evidence of cranial impact injuries." (Pa547-48). The conclusion: "These children provide further evidence that infant shaking alone can cause AHT." (Pa548).

The Feldman study is significant in part because Dr. Scheller was asked during the Frye hearing, "Has anyone ever shown that shaking only can lead to retinal hemorrhages?"

(5T180-6 to 7). The doctor responded, "We don't have any witness accounts." (5T180-8). When the doctor was asked whether there were any cases in which "a third-party witness observed someone else shaking the infant, he responded, "Not that I'm aware of that have been reported in the literature, no." (5T131-19 to 23). The Feldman study provides the witness accounts that Scheller testified were lacking in medical literature on AHT.

Judge Jimenez opined, "AHT is a flawed diagnosis because it originates from a theory based upon speculation and extrapolation instead of being anchored in facts developed through reliable testing." (Pa71). Dr. Scheller testified that there is no "gold standard" test for AHT like there is for a disease like COVID-19. (5T137-12 to 140-6; 8T23-16 to 25-21; Pa35). Judge Jimenez's statements about "reliable testing" and "certainties borne from testing and examination" (Pa71, 76) indicate the court misinterpreted the testimony as meaning that any diagnosis without a "gold standard" test is unreliable.

"Randomized controlled trials (RCTs) are considered to represent the gold standard of scientific studies . . . ." Dorothee Mielke & Veit Rohde1, Randomized controlled trials — a critical re-appraisal, 44 Neurosurgical Rev. 2085 (2022), available at https://link.springer.com/content/pdf/10.1007/

s10143-020-01401-4.pdf. Yet as Dr. Narang explained, "[a]lmost all well-established, undisputed medical diagnoses have no randomized controlled trials (RCTs) supporting or validating their diagnostic criteria." Narang I at 532. Migraine headaches, for example, "have an extensive historical basis in the medical literature for evaluation, diagnosis, and therapy," but "there is not one RCT evaluating the diagnostic criteria for migraine headaches, or their validity." Ibid. Nevertheless, "there is no dispute regarding the validity of migraine headaches as a medical diagnosis." Id. at 532-33.

The same is true "for multiple other well-established, undisputed, common medical diagnoses — viral upper respiratory infections (the common cold), community acquired pneumonia, otitis media (ear infection), depression, and all other psychiatric disorders." Id. at 533. "In short, the requirement that an RCT is necessary in order to validate diagnostic criteria of a particular medical diagnosis is not only inaccurate but also inconsistent with the vast majority of clinical medicine." Ibid.

Thus, the absence of a "gold standard" test does not invalidate a diagnosis, and it certainly does not justify excluding expert testimony as unreliable. This court has recognized post-traumatic stress disorder (PTSD) as a reliable diagnosis, and the methodology for diagnosing that condition is

no more scientific and no more based on a "gold standard" test than the differential diagnosis for AHT. See State v. Hines, 303 N.J. Super. 311, 318-22 (App. Div. 1997); N.J. Div. of Child Prot. & Permanency v. I.B., 441 N.J. Super. 585, 593-96 (App. Div. 2015). This court has also applied the Frye test to the Registrant Risk Assessment Scale (RRAS), an actuarial instrument used "in predicting a sex offender's risk of reoffense," and found the scale reliable, despite testimony that the RRAS "is not empirically derived." R.S., 339 N.J. Super. at 507, 519, 541.

Similarly, in J.L.G., 234 N.J. at 265, the Court considered whether Child Sexual Abuse Accommodation Syndrome (CSAAS) "has a sufficiently reliable basis in science to be the subject of expert testimony." Id. at 272. The Court found the "delayed disclosure" aspect of CSAAS reliable "because scientists generally accept that a significant percentage of children delay reporting sexual abuse." Ibid. The Court reached this conclusion while acknowledging that "[s]tudies in this area often rely on retrospective memory" and "that memories can be falsified between childhood and adulthood, and victims may simply forget that they disclosed earlier." Id. at 295. The Court did not require a "gold standard" test or anything similar. The ACLU argued "that the scientific literature should be discounted because it does not expressly show that child

sexual abuse causes delayed disclosure." Ibid. The Court responded that "the case law in this area does not require such a showing" and that to "satisfy Frye's general acceptance test in criminal cases, the focus properly belongs on whether there is a consensus among scientists that a significant percentage of children who have actually been abused do, in fact, delay disclosure." Ibid.

Here, the medical literature cited by the State shows an overwhelming consensus among medical doctors that violent shaking with or without impact causes the symptoms associated with AHT in "a significant percentage of children." Ibid. Under the Frye standard as articulated in J.L.G., testimony regarding AHT is sufficiently reliable to be admitted at a criminal trial.

Judge Jimenez opined, "AHT is an assumption packaged as a medical diagnosis, unsupported by any medical or scientific testing, based upon scaled down versions of testing done on monkeys, wooden dolls, or other anthropomorphic surrogates . . . . Human babies are very different from . . . monkeys, wooden dolls, or other anthropomorphic surrogates . . . ." (Pa71). This opinion highlights another misunderstanding by the trial court. The State did not dispute that there was uncertainty among biomechanists regarding whether shaking alone can cause the injuries associated with AHT. (Pa71). As the State pointed

out to the trial court, "Dr. Medina and Dr. VanEe's testimony and the biomechanical literature indicate that the scaling laws used to scale to infants have not been validated, the injury tolerance levels used for infants are too high, and the models used cannot accurately simulate an infant's brain." (Pa131; 4T39-5 to 40-12; 7T100-18 to 109-24). The important point, as the State explained to the trial court, is that "the biomechanical community's uncertainties regarding shaking as a mechanism of injury in AHT cases do not invalidate its general acceptance within the medical community." (Pa131).

Again, Judge Jimenez disregarded the documented cases of AHT caused by admitted shaking of infant children and attacked AHT as if it were a diagnosis based only "upon scaled down versions of testing done on monkeys, wooden dolls, or other anthropomorphic surrogates" (Pa71), which it is not. The State did cite some biomechanical studies in support of its position, see e.g., Carole A. Jenny et al., Biomechanical Response of the Infant Head to Shaking: An Experimental Investigation, 34 J. Neurotrauma 1 (2017) (Frye Hearing Exhibit S-4); C.Z. Cory & M.D. Jones, Can Shaking Alone Cause Fatal Brain Injury?: A Biomechanical Assessment of the Duhaime Shaken Baby Syndrome Model, 43 Med. Sci. & L. 317 (2003) (Frye Hearing Exhibit S-5) (Pa131, 165-91; 4T38-18 to 39-4). However, contrary to the

trial court's logic, the limitations of biomechanical studies of AHT do not invalidate AHT as a diagnosis.

Another example of the trial court's failure to properly consider evidence at the Frye hearing is its statement, "Unlike a medical diagnosis concerning an injury to an individual via physical evaluations by medical personnel, AHT is a diagnosis which is not the result of physical evaluations." (Pa73). This statement is directly contradicted by Dr. Medina's expert testimony that AHT is diagnosed only after the child undergoes a physical examination and the examining physician consults with practitioners in "multiple subspecialties in the field of pediatrics and also trauma," as Dr. Medina did in this case. (4T29-8 to 25; 4T96-17 to 20). It also bears mentioning, as one court observed, that "[t]he underlying methodologies used to study and diagnose abusive head trauma — radiological scans, ophthalmologic exams, autopsy of the brain and eyes — are not even controversial." Sissoko v. State, 182 A.3d 874, 901 (Md. Ct. Spec. App. 2018).

Still another example of the trial court's failure to properly consider the evidence is the court's reference to "the nanny cam study by Randy Papetti where no confessions were given but video footage showed different children being shaken and upon their physical examination no retinal hemorrhages where

found." (Pa19). Defense counsel similarly referred to "the study by Papetti." (4T118-12).

That "study" referenced is in fact a law journal article authored by lawyers, not scientists. Randy Papetti et al., Outside the Echo Chamber: A Response to the "Consensus Statement on Abusive Head Trauma in Infants and Young Children," 59 Santa Clara L. Rev. 299 (2019) (Papetti). The article contains a single sentence about nanny cams: "Several caregivers have been caught on video violently shaking infants (e.g., via so-called nanny cams) and none of the infants had retinal hemorrhages, let alone complex or severe retinal hemorrhages." Papetti at 329. To support this assertion, the authors cite another law journal article, Keith A. Findley et al., Shaken Baby Syndrome, Abusive Head Trauma, and Actual Innocence: Getting It Right, 12 Hous. J. Health L. & Pol'y 209 (2012) (Findley). Papetti at 329 n.170. The Findley footnote cited by Papetti cites no source whatsoever. Findley at 237 n.237.

Another source cited by Papetti for his assertion is an article by Steven C. Gabaeff, Challenging the Pathophysiologic Connection Between Subdural Hematoma, Retinal Hemorrhage and Shaken Baby Syndrome, 12 W. J. Emergency Med. 144 (2011), available at https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3099599/pdf/wjem12_2p0144.pdf (Gabaeff). That article states that "shaking episodes have been recorded, but have not been

associated with SBS injury markers," Gabaeff at 146, and references a "Link to Videos of Two Separate Episodes of 'Shaking without Injury," id. at 156, but no videos appear at the Internet address provided.[10] Even assuming those two videos exist, it is unknown what examinations, if any, were performed that would have revealed intracranial or retinal injuries in the purportedly uninjured child or children.

The third and final article cited by Papetti is cited only for the following proposition: "[T]o our knowledge, not a single witnessed case of SBS resulting in 'classic triad' injuries has been published." Papetti at 329 n.170 (quoting Lawrence E. Thibault et al., Letter to the Editor, Commentary on Cerebral Traumatism With A Playground Rocking Toy Mimicking Shaken Baby Syndrome, 53 J. Forensic Sci. 1249, 1249 (2008)). There is no reference to video evidence. Moreover, because the Feldman study provides multiple "witnessed case[s] of SBS resulting in 'classic triad' injuries," ibid., in a published, peer-reviewed scientific article (Pa540-49), the statement cited by Papetti holds no persuasive value.

[10] Dr. Scheller's report cites the Gaebaeff article and provides a link to one video. Dr. Scheller claims "the shaking did not result in the injuries associated with shaking," despite the fact the video shows the shaken child's father describing the child as "lethargic" after nanny visits and despite the video including no discussion of the results of diagnostic testing. (Pa417).

No study was presented in which children were shaken on camera without resulting injuries, and Judge Jimenez should not have referenced the Papetti article as such. Yet even if certain children were shaken on camera and shown to have sustained no injuries, that fact would not invalidate AHT as a diagnosis in other children. Dr. Medina testified that "[n]ot every shake event leads to severe retinal hemorrhages." (4T119-22 to 23). Furthermore, contrary to Judge Jimenez's suggestion, Dr. Medina did not testify that AHT always "involves a finding of the triad." (Pa70).

One more example of the trial court's failure to properly consider the evidence is that although the court's written decision details the testimony of every other witness at the Frye hearing on direct and cross-examination, the decision only acknowledges Dr. Scheller's testimony on direct examination. (Pa7-65). Dr. Scheller's admissions on cross-examination, which were omitted from the court's decision, included that (1) he lied in prior testimony (5T102-13 to 15); (2) he has not practiced as a pediatrician since 1991; (3) his opinions on AHT represent a 5% minority of the medical community (8T5-10 to 12); (4) even in his own field of expertise, the American Academy of Neurology recognizes AHT as a valid diagnosis (8T4-23 to 5-1); (5) he did not know what tests, if any, were performed on the children shaken in the "nanny cam" videos he referenced and

based his opinions on what he saw in news reports or on YouTube (8T19-16 to 22-1); and (6) at least one other court has excluded him from testifying on AHT. (8T7-22 to 9-12).

The trial court focused on the fact that biomechanical studies on AHT have not involved actual human infants and therefore, according to the trial court, cannot accurately establish the degree of force required for shaking to cause the intracranial injuries associated with AHT. This fact should be of little consequence, however, because the threshold for injury will vary in every case according to the force applied by the adult and the infant's susceptibility to injury. What matters, and what the studies cited by Dr. Medina show, is that shaking an infant can cause the "triad" of symptoms associated with AHT.

Moreover, debate within the biomechanical community regarding whether shaking alone can cause the symptoms associated with AHT should not be interpreted as a lack of general acceptance of AHT as a diagnosis in the relevant scientific community.

> With regards to AHT, the relevant scientific community should be those medical providers who, within their discipline, spend a reasonable portion if not majority, of their clinical time and practice in the evaluation and care of children suspected of AHT and abuse, who remain abreast of the most recent peer-reviewed literature on AHT and child abuse, and who either have obtained subspecialty certification, or are eligible

> for subspecialty certification, in the field of child abuse.
>
> [Narang I at 581.]

It bears repeating that Dr. Medina did not opine in this case that shaking alone was the mechanism that caused D.J.'s injuries; the doctor opined that D.J. suffered from AHT "as occurs with a shaking event with or without impact." (Pa117). Dr. Medina also testified, consistent with medical literature, that there could have been "impact into a soft surface," which would cause no "external signs of trauma." (5T52-25 to 53-8). "The malleable head stopping against a soft surface widely distributes cranial contact forces that can remain below the threshold for visible external damage, despite brain deceleration reaching a high magnitude." Ann-Christine Duhaime & Cindy W. Christian, Abusive head trauma: evidence, obfuscation, and informed management, 24 J. Neurosurgery 481, 482 (2019) (Pa576). At trial, Dr. Medina would not testify that shaking always causes "the triad" or that the presence of "the triad" always indicates shaking. Dr. Medina would testify that shaking with or without impact can cause those symptoms and, in her opinion, did in this case.

Defendant would be free to attack Dr. Medina's opinion at trial through cross-examination and presentation of alternative expert opinions. The fact that defense experts may disagree

with the conclusion of the State's medical expert does not warrant barring the State's medical expert from testifying about a diagnosis that is generally accepted in the medical community. See Cavallo, 88 N.J. at 519 (explaining that "[w]here expert testimony is sufficiently reliable to be of assistance to the jury, it should be admitted," even where a "battle of experts" at trial seems inevitable); State v. McGuire, 419 N.J. Super. 88, 126 (App. Div. 2011) ("Defendant's arguments against [the State's expert's] methodology and conclusions might have affected the credibility and weight of his testimony, but not its admissibility."). At trial, the jury would be free to disregard Dr. Medina's testimony and would be instructed accordingly. See Model Jury Charge, "Expert Testimony" 1 (rev. Nov 10, 2003).

The trial court's concern about the "sense of horror" that the words "abusive head trauma" (Pa75) might evoke in jurors could also be addressed in an appropriate jury instruction. Alternatively, Dr. Medina could be instructed to express her opinion using different terminology. That was the remedy suggested by a Michigan court that addressed this issue. In People v. Ackley, 970 N.W.2d 917 (Mich. Ct. App.), appeal denied, 965 N.W.2d 518 (Mich. 2021), the court held that "there is nothing inherently forbidden about a medical expert testifying that a particular injury was unlikely or impossible

to have been sustained accidentally" but that "[t]he expert may not call that manner of injury 'abuse,' because, even if that is a term used in the medical community, it is also a legal conclusion and would be understood by laypersons to connote something different from what another doctor might understand." Id. at 595. Nevertheless, the court affirmed the defendant's conviction of "first-degree child abuse," id. at 588, finding no prejudice to the defendant and indicating not that testimony regarding AHT should have been excluded but that the medical experts should have "phrased their opinions using less emotionally and legally suggestive terminology." Id. at 595-96, 603.

Judge Jimenez's concerns about the suggestiveness of the term "abusive head trauma" — concerns that were not made known to the parties prior to the court's decision – could have been addressed through jury instructions or alternative terminology. Barring Dr. Medina from offering any testimony about AHT was an excessive and improper remedy.

The flaws in the trial court's reasoning are numerous, but put simply, and most importantly, the court misapplied the Frye standard and barred expert medical testimony regarding a diagnosis and methodology that were demonstrated to be generally accepted in the medical community. Absent from Judge Jimenez's seventy-five-page written decision is any reference to

jurisprudence on the reliability of AHT testimony. Courts across the United States and abroad have found AHT to be a reliable diagnosis, Narang I at 580 n.513, and the State is unaware of any published opinion in which a court reached the opposite conclusion.

Even since the issue has become controversial, other jurisdictions have continuously accepted AHT as a reliable diagnosis and have rejected the reasoning adopted by the trial court in this case. See, e.g., Sissoko, 182 A.3d at 904 (collecting cases and observing that "other courts that have considered the threshold admissibility of expert medical testimony that a child victim's injuries or death resulted from abusive head trauma have held that, despite criticism, it remains an accepted and reliable diagnosis"); Wolfe v. State, 509 S.W.3d 325, 339 (Tex. Crim. App. 2017); State v. West, 551 S.W.3d 506, 517 (Mo. Ct. App. 2018); State v. Stewart, 923 N.W.2d 668, 676 (Minn. Ct. App. 2019); In re Morris, 355 P.3d 355, 361 (Wash. Ct. App. 2015); People v. Flores-Estrada, 55 Misc.3d 1015, 1017 (N.Y. Sup. Ct. 2017).

Courts' acceptance of AHT has continued since the Frye hearing in this case. Ackley, 970 N.W.2d at 917; State v. Hatfield, 484 P.3d 891, 901 (Kan. Ct. App. 2021); State v. Allen, 489 P.3d 555, 566 (Or. Ct. App. 2021), review allowed, decision vacated on other grounds, 512 P.3d 446 (Or. 2022).

Sissoko, 182 A.3d at 874, is particularly worthy of this court's attention for several reasons. First, the opinion "summariz[es] the history of shaken baby syndrome/abusive head trauma as described in the reliable medical literature." Id. at 898. Second, the court there applied the Frye standard, not the Daubert standard, as some courts have applied in other jurisdictions. Id. at 903. Third, like the child-victim here, the child-victim there showed no external signs of impact or injury. Id. at 887. Fourth, the court there cited many of the same "authoritative scientific and legal writings," J.L.G., 234 N.J. at 281, cited by the parties here. Id. at 833-905. Fifth, the defendant's expert witnesses included Dr. Scheller. Ibid. Sixth, the opinion cites cases from other jurisdictions holding that AHT "remains an accepted and reliable diagnosis." Id. at 904-05. Finally, the court there held what the State submits should be held here: "that the diagnosis of abusive head trauma remains generally accepted in the relevant medical/scientific communities." Id. at 906.

The State urges this court to join the Sissoko court and many others across the United States in finding AHT to be a reliable diagnosis and an appropriate subject of expert testimony. Judge Jimenez's ruling, which the judge has already used to justify dismissal of defendant's indictment, must not stand. "[T]he Judiciary must ensure that proceedings are fair

to both the accused and the victim." J.L.G., 234 N.J. at 307. In fairness to the voiceless infants who are diagnosed with AHT, and in keeping with our courts' jurisprudence on the admissibility of expert testimony, Judge Jimenez's order barring testimony on AHT must be reversed.

POINT II

THE TRIAL COURT'S ORDER DISMISSING THE INDICTMENT MUST BE REVERSED BECAUSE IT WAS BASED ON THE COURT'S ERRONEOUS EXCLUSION OF EXPERT TESTIMONY ON AHT AND BECAUSE THE EXCLUDED TESTIMONY WAS NOT NECESSARY TO SUSTAIN THE INDICTMENT. (Pa87).

Judge Jimenez dismissed the indictment on the basis that "the State has insufficient evidence to prove causation in this case given the suppression of the testimony concerning 'Shaking Baby Syndrome/Abusive Head Trauma.'" (Pa87). For the reasons discussed in Point I of this brief, the order excluding AHT testimony is erroneous and must be reversed. Moreover, because the exclusion of AHT testimony was the basis for the trial court's dismissal of the indictment, the order dismissing the indictment must be reversed as well.

In addition to resting on the basis of an erroneous evidentiary ruling, the trial court's dismissal of the indictment was improper because there sufficient evidence of defendant's guilt to sustain the indictment even without testimony on the diagnosis of AHT. To sustain a valid indictment, the State need only present the grand jury with "some evidence" as to each element of its prima facie case. State v. Engel, 249 N.J. Super. 336, 359-60 (App. Div.), certif. denied, 130 N.J. 393 (1991). The quantum of evidence presented need not be great, State v. Schenkolewski, 301 N.J. Super. 115,

137 (App. Div.), certif. denied, 151 N.J. 77 (1997), and in determining the sufficiency of the evidence to sustain an indictment, every reasonable inference must be given to the State. State v. N.J. Trade Waste Ass'n, 96 N.J. 8, 27 (1984). Thus, "[o]n a motion to dismiss a criminal indictment, the facts upon which the indictment is based must be viewed indulgently in favor of the State." State v. Fleischman, 383 N.J. Super. 396, 398 (App. Div. 2006), aff'd, 189 N.J. 539 (2007).

Here, even if Dr. Medina were barred from acknowledging the existence of AHT as a diagnosis at trial, the State could present evidence of D.J.'s injuries; evidence regarding the timing of the onset of his neurological symptoms and the timing's significance; evidence that defendant was the only person caring for D.J. when his symptoms suddenly appeared; and testimony by Dr. Medina regarding the possible accidental and physiological causes that were ruled out as the source of D.J.'s injuries. (Pa97-117). Dr. Medina could also testify based on her own experience as a practicing physician in the field of child abuse that inflicted trauma can cause injuries like the ones suffered by D.J. (5T55-13 to 19).

From that circumstantial evidence, a jury could reasonably infer that defendant caused D.J.'s injuries. "[A] jury may draw an inference from a fact whenever it is more probable than not that the inference is true; the veracity of each inference need

not be established beyond a reasonable doubt in order for the jury to draw the inference." State v. Brown, 80 N.J. 587, 592 (1979). "A conviction may be based on circumstantial evidence alone," and "circumstantial evidence may be more certain, satisfying and persuasive than direct evidence." Model Jury Charge, "Circumstantial Evidence" 1 (rev. Jan. 11, 1993).

In light of those principles, Judge Jimenez erred in dismissing the indictment because there was sufficient evidence that defendant caused D.J.'s injuries even without testimony regarding the diagnosis of AHT. More importantly, the judge's order barring AHT testimony was erroneous and thus an improper basis on which to dismiss the indictment. "[T]he decision whether to dismiss an indictment lies within the discretion of the trial court," State v. Hogan, 144 N.J. 216, 229 (1996), and in this case, the trial court abused that discretion. The order dismissing the indictment must be reversed.

CONCLUSION

For the foregoing reasons, the State urges this court to reverse the trial court's orders barring AHT testimony and dismissing the indictment.

Respectfully submitted,

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