Travis Scott#183418 Lakeland Correctional Facility 141 First Street Coldwater. MI 49036

Clerk of the Court MICHIGAN SUPREME COURT PO Box 30052 Lansing, MI 48906

Re: People v Robin Rick Manning Case No#160034 Amicus Curiae

Dear Clerk:

Enclosed for filing for permission to file Amicus Curiae briefing, please find the following: notice of hearing, motion for permission to file Amicus Curiae brief, Amicus-brief in support, motion to waive fees/costs, accompanying affidavit of indigent status, and proof of service

I thank you in advance for your cooperation to this matter, should you have any concerns or comments please feel free to contact me at the above listed address

Respectfully submitted,

Januney 14, 2020

Maria Scott Trayis Scott-Amicus Curiae

cc: SAGINAW COUNTY PROSECUTORS OFFICE Counsel of record for Appellant Manning, Brittany Parling Amicus Curiae-Anthony Legion Amicus Curiae-Gerald Byrd file

PROOF OF SERVICE

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I hereby certify that on the below listed date, I served by US Postal Services via- legal expedited mail forms to the following parties of record:

MICHIGAN SUPREME COURT PD Box 30052 Lansing, MI 48906

SAGINAW COUNTY PROSECUTORS OFFICE 111 S Michigan Ave Saginaw, MI 48602

Arittany D Parling P78870 Attorney for Appellant Robin Manning Jones Day 150 W Jefferson Ave, STE#2100 Detroit, MI 48226

I declare that the aforementioned is true and correct

JANyney 14, 2020 Executed Date

A # 18341X

Travis Scott#183418 (Amicus Curiae-Party) Lakeland Correctional 141 First Street Coldwater, MI 49036

STATE OF MICHIGAN IN THE SUPREME COURT

#11

PEOPLE OF THE STATE OF MICHIGAN, Plointiff-Appellee.

VS.

Supreme Court#160034 COA#345268 LC#84-000570

ROBIN RICK MANNING, Defendant-Appellant Amicus Curiae Anthony Legion Amicus Curiae Travis Scott Amicus Curiae Gerald Byrd

NOTICE OF HEARING

Please Take Notice, that on Tuesday, <u>JAnuary 28</u>, 2020, the undersigned will move this Honorable Court to grant Amicus Curiae Travis Scott's motion for leave to file Amicus Curiae brief in support of Defendant-Appellant Robin Rick Manning in the above captioned case. Notice is hereby given to:

SAGINAW COUNTY PROSECUTOR 111 S. Michigan Ave. Saginaw, MI 48602

Brittany D. Parling P78870 (Counsel of record) Jones Day 150 W Jefferson Ave, Ste. 2100 Detroit, MI 48226

Anumy 14, 20,20 Dated

83418

Lakeland Correctional 141 First Street Coldwater, MI 49036

STATE OF MICHIGAN

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IN THE SUPREME COURT

Appeal from the Michigan Court of Appeals Stephen L. Borrello, PJ., Amy Ronayne Krause, Brock A. Swartzle, JJ.

PEOPLE OF THE STATE OF MICHIGAN,

Plointiff-Appellee.

Supreme Ct. No. 160034 CoA No. 345268

LC No. 84-000570-FC

-VS-

ROBIN RICK MANNING,

Defendant-Appellant.

Amicus Curiae Anthony Legion Amicus Curiae Travis Scott Amicus Curiae Gerald Byrd

MOTION FOR LEAVE TO FILE AMICUS CURIAE BRIEF

NOW COMES, Amici Curiae Anthony Legion, Travis Scott, and Gerald Byrd (interested prisoners) pursuant to MCR 7.312(H)(1) and hereby moves this Honorable Court for permission to file an amicus brief in support of Defendant-Appellant Robin Rick Manning. In support of this motion, amici curiae states:

- (1) Appellant Manning was convicted of First Degree Murder, Felony Firearms, carrying a dangerous weapon with unlawful intent, crimes he committed when he was 18 years old.
- (2) As a result of the conviction, Appellant Manning was sentenced to a mandatory life without parole sentence.

(3) Subsequently, Appellant Manning's convictions were affirmed and all postconviction and collateral review remedies were denied. Amici Curiae adopts by reference, Appellant Manning's factual and procedural history.

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- (4) In 2012. the United States Supreme Court changed the legal landscape in relation to how sentencing judges should impose sentences on those under the age of 18 years old. Specifically the Supreme Court concluded that "[t]hat mandatory life without parole for those under 18 at the time of their crimes violates the Eighth Amendment's prohibition on cruel and unusual punishment." <u>Miller v. Alabama</u>, 567 U.S. 460 (2012).
- (5) Then in 2016, the United States Supreme Court applied <u>Miller</u>, retroactively. See <u>Montgomery</u> v. <u>Louisiana</u>, 136 S.Ct. 718, 736 (2016). In response to <u>Miller/Montgomery</u>, the Michigan Legislature enacted MCL § 769.25 and MCL § 769.25a to address LWOP offenses committed by minors and gave trial judges the discretion to impose sentences ranging from a minimum term between 25-40 years with a maximum term of 60 years, if the prosecuting attorney had not moved the court to reinstate the life without parole sentence after conducting a <u>Miller</u> Hearing.
- (6) In 2017, Dr. Laurence Steinberg, a Temple University Professor and renowned expert in adolescent brain development, testified at a federal evidentiary hearing that the same scientific findings regarding brain development and other hallmark characteristics of juveniles under 18 as determined in <u>Roper</u>, <u>Graham</u>, and <u>Miller</u> apply with equal force to all teenagers. Following Steinberg's expert opinion, a federal district court judge engaged in an extensive and comprehensive analysis of national trends and scientific evidence on late adolescent brain development and held that <u>Miller</u> applies to

18 year olds: "[T]he Eighth Amendment forbids a sentencing scheme that mandates LWOP for offenders who were 18 years old at the time of their offense." <u>Cruz</u> v. <u>U.S.</u>, 2018 U.S. Dist. LEXIS 52924, at *71 (March 29, 2018).

- (7) Subsequently, Appellant Manning filed a successive motion for relief from judgment premised on new scientific evidence and the retroactive application of <u>Miller</u>, supra, as announced in <u>Montgomery</u>, supra. The trial court denied the motion and Appellant Manning filed a timely application for leave to appeal. June 6, 2019, the court of appeals denied leave, but Judge Borrello, J., would have granted leave.
- (8) On December 11, 2019, this Court considered leave in <u>People</u> v. <u>Manning</u>, limited to two separate questions:
 - (a) Whether Defendant's successive motion is based on a retroactive change in law where the law relied upon does not automatically entitle him to relief, and;
 - (b) If so, whether Miller/Montgomery should apply to 18 year old defendants convicted of murder and sentenced to mandatory life without parole.
- (9) This Court also invited "other persons or groups interested in the determination" and instructed them to "move for permission to file briefs amicus curiae." See <u>People</u> v. <u>Manning</u>, 2019 Mich. LEXIS 2320, December 11, 2019.
- (10) Amici Anthony Legion, Travis Scott, and Gerald Byrd are all interested parties in support of Appellant Manning and all other similarly situated teenagers who lacks the skill with and knowledge of litigating criminal law to draft pleadings in this regard. Moreover, no person, individual corporation, counsel, or any other entity has made any financial or other contribution in furtherance of preparing or submitting pleadings in this matter. The issue

being addressed in this case have great importance to the state's Eighth and Fourteenth Amendment jurisprudence, as it relates to the Cruel and Unusual Punishment and Equal Protection Clauses respectively, and will provide guidance to lower courts on how to address the procedural question of when, and/or, how the "retroactive change in law" exception to MCR 6.502(G)(2)'s bar on successive motions applies.

(11) Instead, this motion has been prepared and submitted solely by the efforts of Amici Curiae Legion, Scott, and Byrd because they are proponents of requiring trial courts to consider the mitigating factors of youth for "all" teenagers convicted of first degree murder, where the result of this decision could mean the difference between teenagers either being sentenced to die in prison or having an opportunity to show maturity, growth and rehabilitation after serving between 25-40 years in prison.

WHEREFORE, based on the aforementioned and the reasons articulated in the accompanying brief, this Honorable Court should grant Amici Curiae Legion's, Scott's and Byrd's Motion to file briefs consistent with Appellant Manning's application for leave to appeal.

Date: January 14,2020

spectfully Submitted,

Anthony Legion #380930 Paraprofessional Amicus Curiae

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Travis Scott #183418 Amicus Curiae

Gerald Byrd #682089 Paraprofessional Amicus Curiae

STATE OF MICHIGAN

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IN THE SUPREME COURT

Appeal from the Michigan Court of Appeals Stephen L. Borrello, PJ., Any Ronayne Krause, Brock A. Swartzle, JJ.

PEOPLE OF THE STATE OF MICHIGAN.

Supreme Ct. No. 160034

Plaintiff-Appellee,

COA No. 345268 LC No. 84-000570-FC

-VS-

ROBIN RICK MANNING,

Defendant-Appellant.

-----/

Saginaw County Prosecutor Attorney for Plaintiff 111 S. Michigan Ave.

Saginaw, Michigan 48602

Brittany D. Parling P78870 Attorney for Defendant Jones Day 150 W. Jefferson Ave., Ste. 2100 Detroit, Michigan 48226

AMICUS CURIAE BRIEF IN SUPPORT

OF ROBIN RICK MANNING

Prepared by: Amicus Curiae Anthony Legion Amicus Curiae Travis Scott Amicus Curiae Gerald Byrd

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JURISDICTION

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On December 11, 2019, this Court considered leave to appeal in <u>People v Manning</u>, 2019 Mich LEXIS 2320. The Court also invited "other persons or groups interested in the determination should move for permission to file briefs amicus curiae".

Amici Anthony Legion, Travis Scott, and Gerald Byrd are interested in this Court's determination. Therefore, pursuant to MCR 7.312(H)(1) and MCR 7.305(H)(1), this Court has jurisdiction to entertain an Amicus Curiae brief in support of Defendant-Appellant Robin Rick Manning.

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Statement-of-Questions-Presented

I. Whether the defendant's successive motion for relief from judgment is based on a retroactive change in law relied upon does not automatically entitle him to relief?

Trial Court answered "No"

Court of Appeals answered "No"

Defendant Manning answers "Yes"

II. Whether the United States Supreme Court's decisions in <u>Miller v. Alabama</u>, 567 U.S. 460; 132 S.Ct. 2455; 183 L.Ed.2d. 407 (2012), and <u>Montgomery v. Louisiana</u>, 136 S.Ct. 718, 193 L.Ed.2d. 579 (2016), should be applied to 18 year old defendants convicted of murder and sentenced to mandatory life without parole, under the <u>Eighth Amendment to the United States Constitution</u> or <u>Const. 1963</u>, art. 1 § 16, or both?

Trial Court answered "No" Court of Appeals answered "No" Defendant Manning answers "Yes" Amici Curiae adopt by reference, the Statement of Facts as stated in Defendant Manning's pleadings presented to this Court.

Introduction

This case presents an issue that has great importance and significance to the State's jurisprudence, particularly Eighth Amendment jurisprudence. This Court has had accasion in the past, to consider scientific evidence in deciding important constitutional questions. The issue before the Court today challenges longstanding, yet shifting, societal perceptions about adolescence and when criminal culpability should be mitigated based on youth.

The science before this Court, along with the national consensus, erodes the rationale for drawing a line at the age of 18, at which full criminal culpability attaches. Standards of Decency have evolved to an extent that makes the perception of late-adolescents as less than adults, palatable. These evolving standards reinforced by scientific and sociological research, ought to compel Michigan's Judiciary to render an "evolutionary" ruling to meet the evolving standards. This case presents the scenario that this Court must have contemplated when adding the new court rule MCR 6.502(G)(3).

Scientific advancement has impacted every facet of modern day existence. Given the fact that the nation's highest Court thrice, not only allowed scientific evidence of this sort in, but relied on it in rendering it's decisions in <u>Roper</u> v. <u>Simmons</u>, 543 U.S. 551 (2005), <u>Graham</u> v. <u>Florida</u>, 560 U.S. 48 (2010), and <u>Miller</u> v. <u>Alabama</u>, 567 U.S. 460 (2012), there appears to be no rational basis for closing the judicial doors to science now. In order to accomplish the constitutional goal of equality of treatment of similarly situated persons, this Court should extend <u>Miller</u> to 18-year-olds.

This Court must also address a procedural question. Can Defendant Manning's successive motion be allowed past MCR 6.502(G)(2)'s procedural threshold when the

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retroactive law relied upon does not automatically entitle him to relief. The answer is yes. As set forth infra in Argument I(A), an "entitlement to relief" analysis is an adjudication of the claim's merits, more appropriately conducted at the procedural hurdle of MCR 6.508(D)(3)(b), the "Prejudice" standard. This Court, having previously prohibited courts from resorting to judicial construction where a court rule's language is clear and unambiguous, should agree with Amici Curiae.

ARGUMENTS

I. Defendant's successive notion is based on a retroactive change in law where the claim involves a non-frivolous extension of the rule announced in the case relied upon, based on new scientific evidence of late-adolescent brain development, and determination of entitlement to relief is an adjudication of the merits which is outside the scope of the MCR 6.502(G)(2) procedural threshold, or alternatively, Defendant's claim is sufficiently based on MCR 6.502(G)(3) where it relies on new scientific evidence.

<u>Standard-of-Review</u>

The interpretation of court **rules** is a question of law and is reviewed de novo. <u>People</u> v. <u>Hawkins</u>, 468 Mich. 488, 497 (2003); <u>People</u> v. <u>Traver</u>, 503 Mich. 23, 31, 917 NW2d 260 (2018).

Matters of constitutional and statutory interpretation are reviewed de novo. <u>People</u> v. <u>Skinner</u>, 502 Mich. 89, 99, 917 NW2d 292 (2018).

Discussion

Pursuant to the plain language of the court, a criminal defendant is limited to one and only one motion for relief from judgment filed post-August 1, 1995. MCR 6.502(G)(1). However, a defendant may file a second or subsequent motion based on a retroactive change in law. MCR 6.502(G)(2) states: "A defendant may file a second or subsequent motion based on a retroactive change in law that occurred after the first motion for relief from judgment or a claim of new evidence that was not discovered before the first such motion."

As explained by our court of appeals, MCR 6.502(G)(2) provides the only two exceptions to the prohibition of successive motions. <u>People</u> v. <u>Swain</u>, 288 Mich. App. 609, 632, 794 NW2d 92, 105 (2010). <u>People</u> v. <u>Johnson</u>, 502 Mich. 541 (2018). These two exceptions to the general prohibition against successive motions are strictly enforced. "Any successive motion that does not assert one of these two exceptions is

to be returned to the defendant without filing by the court." <u>Swain</u>, Id. at 631. Accordingly, both the plain text of the court rules and binding precedent instruct that this Court may only consider a motion for relief from judgment which asserts either a retroactive change in law or new evidence that was not discovered before the first motion. Here, Defendant-Appellant Manning meets either exception.

A. Defendant's claim involves a non-frivolous extension of a retroactive rule of low announced in Miller v. Alabama, based on recent scientific research, thus, properly relying on Miller's rule, and MCR 6.502(G)(2)'s plain text does not require a showing of entitlement to relief.

Defendant's claim is based on the United States Supreme Court decision in <u>Miller v. Alabama</u>, 567 U.S. 460 (2012), made retroactive by the court's decision in <u>Montaomery v. Louisiana</u>, 136 S.Ct. 718 (2016). In <u>Miller</u>, the U.S. Supreme Court announced that mandatory life-without-parole sentences , when imposed on juveniles, violated the 8th Amendment's Cruel and Unusual Punishment clause. Defendant argues that, in light of recent scientific research on brain development in late adolescents (18 - 21 year olds) that shows the same indicia of youth that led to the U.S. Supreme Court's holding in <u>Miller</u> for those under the age of 18, applies to 18 year olds, thus, <u>Miller</u>'s rule is applicable.

MCR 6.502(G)(2) serves as a procedural threshold, barring successive motions for relief from judgment unless the defendant's claims relies on new evidence that wasn't previously available, or a retroactive change in law. The Sixth Circuit recently authorized two petitioners, who were 18 years old at the time of their crime, to file successive habeas petitions where they relied on <u>Miller</u>. See <u>In-re</u> <u>Lambert</u>, 2018 U.S. App. LEXIS 25332 (6th Cir. 2018); <u>In-re-Smith</u>, 2019 U.S. App. LEXIS 12538 (6th Cir. 2019). In deciding to authorize the petitioners, the court addressed a procedural question similar to the question before this Court. The court held that the petitioner only needed to make a prima facie showing that his claim relied on <u>Miller</u> and whether the "new rule 'extends' to an applicant 'goes to the

merit of the motion and is for the district court, not the court of appeals." <u>In-re</u> <u>Lembert</u>, supra at *3. Other Federal Court of Appeals have adopted the some approach to authorizing successive habeas petitions that relied on a new rule of constitutional law that involved facts distinct from the case relied upon, focusing on the general rules "logically inherent" in those holdings, "not just on technical holdings." <u>Moore v. United States</u>, 871 F.3d 72, 82 (1st Cir. 2017); See also <u>In-re</u> <u>Hoffner</u>, 870 F3d 301, 308 (3rd Cir. 2017); <u>In-re-Hubbard</u>, 825 F.3d 225, 231 (4th Cir. 2016); <u>In-re-Encinas</u>, 821 F.3d 1224, 1225-26 (10th Cir. 2016).

28 U.S.C. § 2244(b)(2)(A), 28 U.S.C. § 2255(h) and MCR 6.502(G)(2) all serve as procedural thresholds. The sole distinction between the federal statutes and MCR 6.502(G)(2) is that, where a retroactive change in law is involved, the Federal Court of Appeals resolves the threshold inquiry and allows the Federal District Court to address the merits, while both those functions are performed by a single court under MCR 6.502(G)(2). MCR 6.502(G)(2)'s plain language contains no requirement that a defendant establish entitlement to relief at this procedural threshold. The rule only requires that a defendant's claim relies on a retroactive change of law as its federal counterpart 28 U.S.C. § 2244(b)(2)(A). Whether or not Miller entitles defendant to relief is an evaluation of the claim's merits to be resolved at the procedural hurdle of MCR 6.508(D)(3)(b) the "Prejudice" standard. Judicial construction is not permitted where the language of a court rule is "clear and unambiguous." See Universal-Underwriters Ins-Group v. Auto-Club-Ins-Ass'n, 256 Mich. App. 541, 544 (2003). This Court has addressed the application of MCR 6.502(G)(2), holding that a diligence requirement was incongruent with the plain text of the "new evidence" exception. See People v. Swgin, 499 Mich. 920 (2016). That holding applies with equal force here where an "entitlement to relief" requirement is incongruent with the plain text of MCR 6.502(G)(2)'s "retroactive change in law" exception. Therefore, Defendant's motion should be allowed past the

procedural threshold of MCR 6.502(G)(2) as it is sufficiently based on Miller.

B. In the alternative, this Court can still reach the merits of the underlying claim pursuant to MCR 6.502(G)(3)(a), because the evidence is premised on "shifts entailing consensus in a field of scientific knowledge."

Defendant Manning meets the "retroactive change in law" exception of (G)(2) as corved out in <u>Montgomerv</u>, supra. However, if this Court concludes otherwise, it can still adjudicate the substantive claim under MCR 6.502(G)(3)(a)¹ because the new evidence is based on brain science.

Here, Defendant Manning's motion asserts the existence of new scientific evidence in avoidance of any procedural barriers. Specifically, the contention is that recent shifts and developments in the scientific field of late-adolescent brain development provides the gateway entry for filing a successive motion. Such evidence relied upon in Defendant's pleadings falls squarely within the (G)(3)(a) requirements which expressly defines "new evidence" as shifts entailing consensus in a field of scientific knowledge, the testifying of experts opinion or knowledge or the scientific method on which relevant evidence was based.

This new scientific evidence has continued to evolve since Defendant Manning's previous successive motion for relief from judgment and he relies on more recent research by Dr. Steinberg and national consensus, which concerns not only those persons considered to be juveniles by law, but those who are in the early stages of what the law deems to be adulthood by virtue of their having attained the age of 18. See Fordham L. Rev 641, 666 n. 156 (2016) (encouraging courts to create a transitional legal category of youth aged 18-20 years old); See Dr. Steinberg's

¹On January 1, 2019, this Court grafted the amendment of MCR 6.502(G)(3)(a) to reflect new scientific evidence.

expert opinion at the <u>Cruz</u> 2017 evidentiary hearing, Appendix A (Steinberg opined that there was no difference in the brain development of those 18-20 than those 16 and 17 years old). <u>Id</u>. at 70 -71; see also <u>Cruz</u>, supra (relying on national consensus and Steinberg's expert opinion on the new brain science for late-adolescents).

Accordingly, considering that research in the field of brain development has only recently turned its attention to the brain science of persons termed by the scientific comunity to be late-adolescents, this Court should conclude that Defendant Manning's pleading is grounded in newly discovered evidence. And since Manning has properly asserted a valid exception to the procedural bar against successive motions, his present motion should be permitted for review consistent with the plain language of MCR 6.502(G)(3)(a).

Thus, this Court should proceed to adjudicate the substantive merits of the underlying claim.

II. Miller and Mantgomery should be applied to 18-year-old defendants convicted of murder and sentenced to mandatory life without parole when National Cansensus, recent scientific and sociological research revealed that the scientific findings that underpinned Dr. Steinberg's canclusions about those under the age of 18, relied upon in Miller, also apply to 18 year olds. Failure to extend the holding in Miller would run afoul of the Eighth and Fourteenth Amendments.

Standard-of-Review

Whether a statute is constitutional is a question of law that this court reviews de novo. <u>People</u> v. <u>Begn</u>, 244 Mich. App. 103, 105 (2000). "Statutes are presumed to be constitutional, and the party challenging the statute has the burden of showing the contrary." <u>People</u> v. <u>Dillon</u>, 296 Mich. App. 506, 510 (2012).

Discussion

Defendant Manning argues that this Court should extend the holding in <u>Miller</u> because the "national consensus disfavors applying mandatory life without parole to 18-year olds and that the science² indicates the same indicia of youth that made mandatory life without parole unconstitutional for those under the age of 18 in <u>Miller</u>, also applies to 18 year olds." <u>Cruz</u> v. <u>United-States</u>, 2018 U.S. Dist. LEXIS 52924, *37.

A. Miller/Montgomery applies to 18 year olds sentenced to mandatory life without parale.

Many state and federal courts, including the Michigan Court of Appeals in <u>People</u> v. <u>Conner</u>, 2019 Mich. App. LEXIS 8047 and <u>People v. Jordan</u>, 2017 Mich. App. LEXIS 367, presented with this issue have held that they were prevented from

²Scientific Opinion of Dr. Laurence Steinberg on brain development in late adolescents (18-21 year olds) concerning decision-making processes, making late-adolescents indistinguishable from mid-adolescents (14-17 year olds) as it relates to emotional regulation, as set forth in Cruz Evidentiary Hearing Transcripts, Appendix A.

applying <u>Miller</u> to an 18-year-old because they must follow the Supreme Court's binding precedent, essentially inferring by negative implication that the <u>Miller</u> Court also held that mandatory life without parole is necessarily constitutional as it is applied to those over the age of 18. "The <u>Miller</u> opinion contains no statement to that effect," nor does it suggest that courts are prevented from finding that the Eighth Amendment prohibits mandatory life without parole for those over the age of 18." <u>Cruz</u>, supra at *37. Although extending <u>Miller</u> to 18-year-olds would apply the rule to a different set of facts not contemplated by the case, it would not be contrary to <u>Miller</u>.

Reading <u>Miller</u> in this way is consistent with the Supreme Court's "reluctance to decide constitutional questions unnecessarily." See <u>Bowen</u> v. <u>United States</u>, 422 U.S. 916, 920 (1975). Many courts faced with this question held that <u>Miller</u> drew a bright line at 18 years old, which prevents them from applying the rule in <u>Miller</u> to an 18 year old. These courts have failed to recognize that there are different kinds of lines:

"...in <u>Thompson</u> v. <u>Oklahoma</u>, 487 U.S. 815, 108 S.Ct. 2687, 101 L.Ed.2d. 702 (1988), the Supreme Court held that the death penalty was unconstitutional for offenders under the age of 16. <u>Id</u>. at 838. It was not until <u>Stanford</u> v. <u>Kentucky</u>, 492 U.S. 361, 109 S.Ct. 2969, 106 L.Ed.2d. 306 (1989), rev'd by <u>Roper</u>, 543 U.S. at 574, however, that the Supreme Court held that the Eighth Amendment did not prohibit the execution of offenders ages 16 to 18. <u>Id</u>. at 380. In <u>Stanford</u>, the Court did not say that the ruling it set forth was found in the <u>Thompson</u> holding. Indeed, <u>Stanford</u> was not redundant of <u>Thompson</u> because the line drawn in <u>Thompson</u> looked only in the direction of offenders under the age of 16 and found them to be protected by the Eighth Amendment. <u>Thompson</u>'s line did not simultaneously apply in the other (i.e. older) direction to prohibit the Eighth Amendment from protecting those over the age of 16. In contrast, Stanford's line did.

This distinction between the type of line drawn in <u>Thompson</u> and the type of line drawn in <u>Stanford</u> is reflected in the difference in the Supreme Court's treatment of these two cases in <u>Roper</u> v. <u>Simmons</u>. In deciding that the death penalty was unconstitutional as applied to offenders under the age of 18, the <u>Roper</u> Court considered itself to be overturning <u>Stanford</u>, but not <u>Thompson</u>. Compare <u>Roper</u>, 543 U.S. at 574 ("<u>Stanford</u> v. <u>Kentucky</u> should be deemed no longer controlling on this issue."); with Id. ("In the intervening years the <u>Thompson</u> plurality's conclusion that offenders under 16 may not be executed has not been challenged. The logic of <u>Thompson</u> extends to those who are under

18."). If the Government's argument that the line drawn in <u>Miller</u> prevents this court from applying its rule to an 18-year-old were correct, the same logic applied to the line drawn in <u>Thompson</u> would have required <u>Roper</u> to overturn <u>Thompson</u> rather than relying on and endorsing it. The language in <u>Roper</u>, however, makes clear that the court endorsed, rather than overturned, <u>Thompson</u>. See <u>Roper</u>, 543 U.S. at 574.

In drawing the line at 18, then, <u>Roper</u>, <u>Grahom</u>, and <u>Miller</u> drew lines similar to that in <u>Thompson</u>, protecting offenders that fall under the line while remaining silent as to offenders that fall above the line. In the case of mandatory life imprisonment without parole, no Supreme Court precedent draws a line analogous to that in <u>Steaford</u>. Therefore, while this court recognizes that it is undoubtedly bound by Supreme Court precedent, it identifies no Supreme Court precedent that would preclude it from applying the rule in <u>Miller</u> to an 18-year-old defendant."

<u>Cruz</u>, supra at *39-*41. In light of Judge Hall's analysis, the questions of <u>Miller</u>'s application to those under 18, and over 18, are mutually exclusive questions and <u>Miller</u> did not address the latter question or preclude consideration of that question, just as the holding in <u>Thompson</u> did not preclude the extension of the prohibition of the death penalty for those under 16, to those under 18 announced in <u>Roper</u> v. <u>Simmons</u>, 543 U.S. 551 (2005). Courts that read <u>Miller</u> in such a way as to infer by negative implication, that mandatory life without parole sentences for those over 18 are constitutional, essentially hold that the United States Supreme Court announces rules through its speech and its silence.

The Michigan Court of Appeals, and many other federal and state courts, in <u>People v. Conner</u>, supra, in holding that <u>Miller</u> did not apply to 18 year olds, noted that the <u>Miller</u> and <u>Graham</u> decisions were rooted in <u>Roper</u>, and in focusing on the line drawn in <u>Roper</u> at age 18, missed the fact that <u>Roper</u> involved an expansion of the rule in <u>Thompson</u> prohibiting the death penalty for those under 16 in lieu of overturning <u>Thompson</u> as explained supra by Judge Janet Hall in <u>Cruz</u>, supra. Defendant Manning's request to expand <u>Miller</u> to 18 year olds, then, is precedented and, in light of recent scientific research and findings, this Court should follow the <u>Roper</u> court's example and extend <u>Miller</u> to 18 year olds with mandatory life

without parole sentences. Reading <u>Miller</u> in the way that the <u>Conner</u> court, and many others, has done epitomizes the "unreasonable application" of U.S. Supreme Court precedent contemplated by Congress when they enacted 28 U.S.C. § 2254(d)(1).

. . .

i. Mandatory Life without Parole sentences for 18-year-olds violate the Eighth Amendment's Cruel and Unusual Punishment Clause.

"The Michigan Constitution prohibits cruel <u>or</u> unusual punishment, Const. 1963, art 1, § 16, whereas the United States Constitution prohibits cruel <u>and</u> unusual punishment, U.S. Const. Am. VIII." <u>People v. Benton</u>, 294 Mich. App. 191, 204 (2011). "If a punishment passes muster under the state constitution, then it necessarily passes muster under the federal constitution." <u>Id.</u> (citation and quotation marks omitted).

Whether a penalty or sentence imposed against a defendant can be considered cruel or unusual is to be determined by a three-pronged test including: "(1) the severity of the sentence imposed and the gravity of the offense, (2) a comparison of the penalty to penalties for other crimes under Michigan law, and (3) a comparison between Michigan's penalty and penalties imposed for the same offense in other states." <u>Id.</u> (citation omitted).

The Eighth Amendment's prohibition of cruel and unusual punishment requires that "punishment for crime should be graduated and proportioned to the offense." <u>Cruz</u>, supra (quoting <u>Roper</u>, 543 U.S. at 560 (internal quotation marks omitted)). This proportionality principle requires the court to evaluate "'the evolving standards of decency that mark the progress of a maturing society' to determine which punishments are so disproportionate as to be cruel and unusual." <u>Id.</u> (citing <u>Roper</u>, at 561 quoting <u>Trop</u> v. <u>Dulles</u>, 356 U.S. 86, 100-01 (1958)).

In 2005, the U.S. Supreme Court announced that the death penalty was unconstitutional for persons under the age of 18. <u>Roper</u>, 543 U.S. at 574. The <u>Roper</u>

Court relied on national consensus and the diminished penological justification resulting from the hallmark characteristics of youth. See <u>Id.</u> at 567, 572-573. In <u>Roper</u>, the defendant was 17 years and 5 months old at the time of the murder. <u>Id</u>. at 556, 618.

In 2010, the Supreme Court in <u>Graham</u> v. <u>Florida</u> extended the reasoning in <u>Roper</u> to find that life imprisonment without parole is unconstitutional for juvenile nonhomicide offenders. See <u>Graham</u> v. <u>Florida</u>, 560 U.S. 48, 74 (2010). Like the <u>Roper</u> Court, the <u>Graham</u> Court again considered national consensus and the fact that the characteristics of juveniles undercut the penological rationales that justified life without parole sentences for nonhomicide offenses. See <u>Id</u>, at 62-67, 71-74. In <u>Graham</u>, the defendant was 16 at the time of the crime. See <u>Id</u>. at 53. Thus, the <u>Graham</u> Court did not need to reconsider the line drawn at age 18 in <u>Roper</u>, but rather adopted that line without further analysis, quoting directly from <u>Roper</u>. See <u>Id</u>. at 74-75 ("Because '[t]he age of 18 is the point where society draws the line for many purposes between childhood and adulthood,' those who were below that age when the offense was committed may not be sentenced to life without parole for a nonhomicide crime." (quoting <u>Roper</u>, 543 U.S. at 574)).

In 2012, as noted supra, the Supreme Court in <u>Miller</u> further extended <u>Grahem</u> to hold that mandatory life imprisonment without parole is unconstitutional for juvenile offenders, including those convicted of homicide. See <u>Miller</u>, 567 U.S. at 465. The defendants in <u>Miller</u> were 14 years old at the time of the crime, and the <u>Miller</u> Court, like the <u>Grahem</u> Court, adopted the line drawn in <u>Roper</u> at age 18 without considering whether the line should be moved or providing any analysis to support that line. See <u>Id</u>. at 465 ("We therefore hold that mandatory life without parole for those under the age of 18 at the time of their crimes violates the Eighth Amendment's prohibition on 'cruel and unusual punishments.'").

In deciding this question, this Court should look to the national consensus and developments in the scientific evidence on the hallmark characteristics of youth that the Supreme Court considered in <u>Roper, Graham</u>, <u>Miller</u>.

The decisions in <u>Roper</u>, <u>Grahom</u>, and <u>Miller</u> all address "whether 'objective indicia of society's standards, as expressed in legislative enactments and state practice,' show a 'national consensus' against a sentence for a particular class of individuals." <u>Miller</u>, 567 U.S. at 482 (quoting <u>Grahom</u>, 560 U.S. at 61). In <u>Roper</u>, the Supreme Court identified three "objective indicia of consensus" in determining that societal standards considered the juvenile death penalty to be cruel and unusual: (1) "the rejection of the juvenile death penalty in the majority of States;" (2) "the infrequency of its use even where it remains on the books;" and (3) "the consistency in the trend toward abolition of the practice." <u>Roper</u>, 543 U.S. at 567. See consensus discussed in <u>Roper</u>, 543 U.S. at 567, 569, 574; <u>Grahom</u>, 560 U.S. at 61-63 66; <u>Miller</u>, 567 U.S. at 482, 485; and <u>Cruz</u>, supra at *49, *51, *53-*58.

While it is acknowledged that the issue before this Court is whether national consensus exists as to practices of sentencing 18 year olds to mandatory life imprisonment without parole, this Court, as the U.S. Supreme Court did in <u>Raper</u>, should consider other evidence of line-drawing between juveniles and adults to still be relevant to its determination. In drawing the line at age 18, the <u>Roper</u> Court looked to evidence beyond the death penalty context. See <u>Roper</u>, 543 U.S. at 574 ("The age of 18 is the point where society draws the line for many purposes between childhood and adulthood. It is, we conclude, the age at which the line for death eligibility ought to rest."). While the question presented by this Court would lead the court to place greater weight on national consensus about mandatory life without parole sentences, the example that the <u>Roper</u> court set in reaching their decision

should be adopted, i.e., consideration of "where society draws the line for many purposes between childhood and adulthood" to be a relevant consideration. Id.

Scientific Evidence

"Community consensus, while entitled to great weight, is not itself determinative of whether a punishment is cruel and unusual." <u>Graham</u>, 560 U.S. at 67 (internal quotation marks omitted). This Court retains the responsibility of interpreting the Eighth Amendment. <u>Cruz</u>, supra at *59 (citing <u>Roper</u>, 543 U.S. at 575). To that end, "[t]he judicial exercise of independent judgment requires consideration of the culpability of the offenders at issue in light of their crimes and characteristics, along with the severity of the punishment in question." <u>Graham</u>, 560 U.S. at 67.

"The Court in <u>Roper</u>, <u>Grahom</u>, and <u>Miller</u> thus looked to the available scientific and sociological research at the time of the decisions to identify differences between juveniles under the age and fully mature adults-- differences that undermine the penological justifications for the sentences in question. <u>Cruz</u>, supra at *59 (citing <u>Roper</u>, 543 U.S. at 569-72; <u>Grahom</u>, 560 U.S. at 68-75; <u>Miller</u>, 567 U.S. at 471 ("Our decisions rested not only on common sense-- on what "any parent knows"-but on science and social science as well.").

The Supreme Court in these cases identified "three general differences between juveniles under 18 and adults": (1) that juveniles have a lack of maturity and an underdeveloped sense of responsibility," often resulting in "impetuous and ill-considered actions and decisions;" (2) that juveniles are "more vulnerable or susceptible to negative influences and outside pressures, including peer pressure;" and (3) that "the character of a juvenile is not well formed as that of an adult." <u>Roper</u>, 543 U.S. at 569-70; see <u>Graham</u>, 560 U.S. at 68; <u>Miller</u>, 567 U.S. at 471-72.

The same reasoning applies to Defendant Manning, in light of the scientific findings of Dr. Steinberg.

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As to the first characteristic identified in <u>Roper</u> ("lack of maturity and an underdeveloped sense of responsibility" as manifested in "impetuous and illconsidered actions and decisions"), the scientific evidence before the court clearly establish that the some traits are available in 18-year-olds. <u>Roper</u>, 543 U.S. at 569. In support of this assertion, Amici Curiae offer the expert testimony of Dr. Steinberg and a scientific article. See Appendices A: Cruz Evidentiary Hearing w/ Dr. Steinberg's testimony; and C: Around the World, Adolescence is a Time of Heightened Sensation Seeking and Immature Self-Regulation, Developmental Science 00 (2017).

In his testimony, Dr. Steinberg divided adolescence into three categories, defining early adolescence as occurring between ages 10-13, middle adolescence between ages 14-17, and late adolescence between 18-21. See Appendix A, at 11. He defined two different decision-making processes: cold cognition, which occurs when an individual is calm and emotionally neutral, and hot cognition, which occurs when an individual is emotionally aroused, such as in anger or excitement, see <u>Id</u>. at 9-10, and explained that while cold cognitive abilities are mature around the age of 16, the emotional regulation required for hot cognitive abilities are not fully mature until early- or mid- 20s. <u>Id</u>. at 10; see also <u>When-Does a-Juvenile-Become-an</u> <u>Adult? Implications_for_Law_and_Policy</u>. 88 Temple L. Rev. 769, 786 (2016) (finding that, "relative to adults over twenty-one, young adults show diminished cognitive capacity, similar to that of adolescents, under brief and prolonged negative emotional arousal").

Dr. Steinberg also testified that late adolescents "still show problems with impulse control and self-regulation and heightened sensation-seeking, which would

make them in those respects more similar to somewhat younger people than to older people." Appendix A, at 19. Steinberg testified that impulse control is still developing during late adolescent years, See <u>Id</u>. at 20, and are more likely to take risks than adults or middle or early adolescents. <u>Id</u>. at 20. According to Dr. Steinberg, risk-seeking behavior peaks around ages 17 to 19 and declines into early adulthood. <u>Id</u>.; See also Appendix C, at 10 (graph, illustrating the trajectory of sensation-seeking behavior, as related to age, as an upside-down "U" with the peak at age 19). The scientific evidence, thus, shows the similar characteristics of immaturity and impulsivity of 18-year-olds and juveniles under age 18.

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The same conclusion can be drawn for susceptibility of 18-year-olds to outside influences and peer pressure, the second characteristic of youth identified in <u>Roper</u>. Dr. Steinberg testified that the ability to resist peer pressure is still developing during late adolescence. See Appendix A, at 20-21. Therefore, susceptibility to peer pressure is higher in late adolescence than in adulthood, but slightly lower than in middle adolescence. <u>Id</u>. In fact, according to Dr. Steingberg's research, up until the age of 24, people exhibit greater risk-taking and reward-sensitive behavior when in the presence of their peers. <u>Id</u>. at 24-25. Therefore, again like juveniles under age 18, 18-year-olds also experience similar susceptibility to negative outside influences.

Lastly, on <u>Roper's</u> third characteristic of youth-- that a juvenile's personality traits are not as fixed-- Dr. Steinberg testified that lateadolescents, like those under age 18, **simply are** more capable of change than are adults. <u>Id</u>. at 21. Dr. Steinberg expressed absolute confidence in the fact that development is still occurring in late adolescence, <u>Id</u>. at 62, and stated that if he were to write a previous article that he had written entitled "Less Guilty by Reason of Adolescence: Developmental Immaturity, Diminished Responsibility, and the

Juvenile Death Penalty, 58 Am. Psychol. 1009 (2003)," today, with the developments in scientific knowledge about late adolescence, he would say "the same things are true about people who are younger than 21." Appendix A, at 22. Dr. Steinberg stated that he was "absolutely certain" when asked whether or not he could state to a reasonable degree of scientific certainty that the findings that underpinned his conclusions as to the defendants in <u>Grahom</u> and <u>Miller</u>, who were under the age of 18, also applied to an 18-year-old.

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Since the <u>Miller</u> Court did not have before it the recent scientific and sociological research that this Court has before it, and only decided the constitutional question before them with no need to contemplate the question before this Court, the <u>Miller</u> Court did not address, and its holding does not preclude, this Court from deciding this question. This Court should hold that mandatory life without parole sentences for defendants who were 18 at the time their offenses, violates the U.S. Const. Am. VIII, and as a consequence, MCL §§ 750.316, 769.25 & 769.25a are unconstitutional as applied to those who were 18 at the time of their crime.

ii. Failure to extend Miller to 18-year-olds; and amend MCL §§ 750.316, 769.25 and 769.25a to reflect such extension, violates the Equal Protection Clauses of both Const. 1963, art. 1, § 2 and U.S. Const. Am. XIV.

The Fourteenth Amendment of the United States Constitution provides that "no State shall... deny to any person within its jurisdiction the equal protection of the laws." U.S. Const. Am. XIV. Where a classification involves a fundamental right, it is subject to strict scrutiny. <u>Harvev</u> v. <u>Michigan</u>, 469 Mich. 1, 6-7; <u>Plyler</u> v. <u>Doe</u>, 457 U.S. 202, 216-217 (1982). When strict scrutiny review is warranted, the State is required to demonstrate that its decision is precisely tailored, serve a compelling governmental interest and, the challenger, that conflict between the statute and the Constitution be palpable and free from reasonable doubt." <u>Evans</u>

<u>Prods. Co.</u> v. <u>Fry</u>, 12 NW2d 448, 457 (1943); Plyler, at 216-217; <u>DeRose</u> v. <u>DeRose</u>, 469 Mich. 320, 353 (2003).

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Amici Curiae assert that distinguishing between those under the age of 18, and over the age of 18, as it relates to affording the former the Eighth Amendment right to a proportionate punishment when recent scientific and sociological research establish that they are similarly situated with the latter, violates the Fourteenth Amendment's and Const. 1963, art. 1, § 2's Equal Protection Clause. Amici Curiae ask that this Court exercise it's "power" to use the scientific evidence before them "to determine the true state of facts upon which" MCL §§ 750.316, 769.25 and 769.25a is based. (quoting <u>People</u> v. <u>Sinclair</u>, 387 Mich. 91, 103 (1972) (citing <u>Brown</u> v. <u>Board of Education</u>, 347 U.S. 483 (1954)). The fundamental right involved is the Eighth Amendment right to proportionate punishment, or stated another way, to not be cruelly and unusually punished.

This Court has considered scientific evidence before in holding that a statute violated the state and federal constitutions. In <u>People</u> v. <u>Sinclair</u>, this Court held that MCLA 335.151 in its classification of marijuana as a narcotic violated the Equal Protection Clauses of both the U.S. Const. Am. XIV and Const. 1963, art. 1, § 2. <u>Id</u>. at 115. In doing so, this Court compared the properties of marijuana and other drugs classified as narcotics under MCLA 335.151 et seq. <u>Id</u>. at 104, 107-108. In making this comparison, the Court acknowledged that the science wasn't complete, and in comparing it with scientific knowledge of alcohol's mind-altering affects to show that its incompleteness was not dispositive, stated: "Even society's vast experience with the mind-altering effects of alcohol has not led to complete scientific knowledge of that drug." <u>Id</u>. at 104.

The Court also considered an article which it thought documented well "the murky atmosphere of ignorance and misinformation which casts it pall over the state

and federal legislatures' original classification of marijuana with the hard narcotics..." <u>Id</u>. at 113 (citing R. Bonnie and C. Whitebread, II, The Forbidden Fruit and the Tree of Knowledge: An Inquiry into the Legal History of American Marijuana Prohibition, 56 Va. L. Rev. 971 (1970)). Despite the Court stating that science regarding marijuana was incomplete, it stated: "we do have sufficient knowledge to categorize drugs according to their relative level of danger to both the individual and society." <u>Id</u>. at 105. The Court, after consideration of the science and articles, found the statute unconstitutional.

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This Court again is presented with an issue that is similar in material respects. Unlike the <u>Sincloir</u> Court though, this Court has a far more complete scientific evidence before it, on the similarity of brain development in those under 18 and late adolescents (ages 18-21), that is globally supported, than the Sinclair Court had concerning marijuana and other drugs. The Sinclair Court relied on the science and articles to separate marijuana from the "hard drug" classification, while this Court would rely on the evidence presented to join 18-year-olds to the juvenile classification of those under the age of 18 as it pertains to mondatory life without parole sentences. This Court also has before it several articles in support of Defendant Manning's position. See Appendix C; see also When. Does a Juvenile_Become_an_Adult?, supra; Young_Adulthood_as_a_Transitional_Leagl_Category, 85 Fordhom L. Rev. 641 (2016). These articles, as R. Bonnie and C. WhiteBread's orticle did in Sinclair, masterfully document the "murky atmosphere of ignorance and misinformation which casts its pall over the state and federal legislatures'" classification of 18-year-olds as fully grown adults to be treated dissimilarly to defendants under the age of 18 as it relates to mandatory life without parole sentences.

The Eighth Amendment right at issue was announced in Miller, supra, and made

retroactive in <u>Montgomery</u>, supro. As argued supra in Argument II(A)(i), scientific and sociological research, along with national consensus, establish that the same conclusions that led to the rule in <u>Miller</u>, applies to 18-year-olds. There exists no rational basis, therefore, to treat juveniles under 18 differently than 18-yearalds. The Legislature has refused to amend MCL §§ 750.316, 769.25 and 769.25a to protect the Eighth Amendment rights of 18-year-olds, presumably, because of conservative political ideologies or concerns about the judicial resources required to accommodate such amendments. Many state and federal courts may also have concerns about judicial economy as it relates to extending <u>Miller</u>'s holding to 18-year-olds, but the interest of justice should outweigh those concerns.

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Given the fact that this Court has considered a similar evidentiary record in ruling on a statute's constitutionality before, it should extend <u>Miller</u> to 18-yearolds. This Court should also hold that MCL §§ 750.316, 769.25 and 769.25a are violative of Const. 1963, art. 1, § 2 and U.S. Const. Am XIV in their separation of 18-year-olds from those under 18 to preclude 18-year-olds from having "Miller" hearings to consider their youthful characteristics before imposing a sentence in lieu of mandatory life without parole.

B. Although this Court granted leave to determine whether <u>Miller</u> should be extended to 18-year-olds, it should also extend <u>Miller</u> to all late adolescents (18-20) based on the same scientific findings, which is within this Court's inherent authority under MCR 7.316(A)(7).

Amici Curiae are mindful that this Court elected to consider whether <u>Miller</u> should be extended exclusively to 18-year-olds. But the same scientific findings relied upon by Defendant Manning (regarding 18-year-olds) are equally applicable to those categorized as late adolescents, aged 18-20. In order to prevent repetitious pleadings premised on the same scientific evidence, the same expert, the same national consensus, the same jurisprudence, and essentially the same legal arguments from a core class of individuals 18-20 years old, this Court should also consider
whether the holding in <u>Miller</u> applies with equal force to all late adolescents by utilizing it's discretionary powers under MCR 7.316(A)(7).

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i. Even though this court did not specifically grant leave to consider whether <u>Miller</u> should be extended to the late-adolescent class in their entirety (18-20), the Court can still expand it's consideration to such by exercising the discretionary powers through the miscellaneous provisions set forth in MCR 7.316(A)(7).

This is an interesting case with a novel backdrop of favorable national consensus, reliable scientific findings by a renowned expert, and persuasive arguments from the analytical proposition that late adolescents over 18-- are the functional equivalent of mid-adolescents under 18-- with respect to brain development and all the other hallmark characteristics as found in <u>Roper</u>, <u>Graham</u>, and <u>Miller</u>. But because this Court only opted to consider whether <u>Miller</u> should be extended to an 18-year-old, all other late-adolescents identically situated may have to spend the rest of their life in prison if this Court does not extend its consideration (which would be fundamentally unfair). In situations as such, this Court can always invoke it's miscellaneous powers and extend the review even though the specific question was not actually on the table. MCR 7.316(A)(7).

Indeed, the Supreme Court may, at any time, in addition to it's general powers: "enter any judgment or order that ought to have been entered and enter other and further orders and grant relief as the case may require." MCR 7.316(A)(7). The language of MCR 7.316(A)(7) is based upon this Court's inherent authority to do what "ought" to be done-- even when it might contradict other rules. See <u>St. John</u> v. <u>Nichols</u>, 331 Mich. 148, 159 (1951) ("While this Court should and does give due regard to its own rules, the promulgation thereof cannot shackle the powers of this Court to do that which ought to be done if otherwise within the powers of the court.") Thus, this miscellaneous provision provides this Court with the inherent power to do what "ought" to be done and in this case, it should decide whether the holding in <u>Miller</u> should be extended to

late-adolescents 18-20 years old.

In sum, even though Defendant Manning has not requested for a full extension to all late-adolescents, in order to prevent repetitious pleadings that would infringe upon judicial economy, this Court should exercise it's miscellaneous powers and extend the consideration to 18-20 year olds.

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ii. <u>Miller has direct application to late-adolescents 18-20 years old.</u>

This Court should start the inquiry with the fundamental premise from Dr. Steinberg, where he opined that he is "[a]bsolutely certain" that the scientific findings that underpin his conclusions about those under the age of 18 also apply to 18-20 year olds. Appendix A, at 70-71. Moreover, Steinberg indicated that "[i]f a different version of <u>Roper</u> were heard today, knowing what we know now, one could've made the very same arguments about 18, 19, and 20 year olds, that were made about 16 and 17 year olds in <u>Roper</u>." Appendix B.

The <u>Grahom</u> Court concluded that adolescents cannot fairly be expected to be capable of the same level of control over, or responsibility for, their own behavior as older offenders 21 and over and should be viewed as having more rehabilitative potential than adult offenders. <u>Grahom</u>, 560 U.S. 76. At the very least, the <u>Grahom</u> Court indicated, "[c]riminal procedure laws that fail to take defendant's youthfulness into account at all would be flawed." <u>Id</u>.

Here, Amicus Curiae Travis Scott, has a vested interest in the <u>Miller</u> extension to late-adolescents because he was 19 years and 45 days old when he committed first degree murder on January 1, 1986. Amicus Curiae Scott was subsequently sentenced to LWOP. <u>People</u> v. <u>Scott</u>, COA# 93428 (1988) (LC No. 86-660099). While not necessarily binding authority, this Court can consider, as persuasive argument, a case with striking similarities involving an Illinois appellate court that set aside a LWOP

sentence given to a 19 year old because the sentencing court failed to consider mitigating factors outlined in <u>Miller</u>. See <u>People</u> v. <u>House</u>, 72 NE3d 357, 410 III Dec 971 (III App 2015). In affirming, the higher court found that a 19 year old sentenced to LWOP was unconstitutional under the proportionate penalties clause, and found that <u>Roper</u>'s division between those over and under 18 years of age was not a bright line rule. See <u>People</u> v. <u>House</u>, 2019 III 110580-B at 54, 64 App (1st). (May 16, 2019). By comparison, House was 19 years and 60 days old. Like House, Amicus Curiae Scott was not entitled to mitigation consideration because he was mandated by MCL § 750.316 (late-adolescent or not) to serve a mandatory life sentence.

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When carefully considering Dr. Steinberg's roundly, accepted scientific opinion and national consensus, strongly supports the proposition that late-adolescents should be entitled to mitigation consideration. Steinberg opined that the risktaking behavior for adolescence actually peaks at the age of 19. Appendix A, at 20. But Steinberg also had no problem indicating that there was no difference between those 18, 19, and 20, as to those 16 and 17, but was not confident to reach that conclusion to a reasonable degree of scientific certainty to those 21 years old. Appendix A, at 70-71. The Supreme Court even recognized "that the qualities that distinguish juveniles from adults do not disappear when the individual turns 18 years old." <u>Roper</u>, 543 U.S. 574.

The <u>Roper</u> Court relied on <u>Thompson</u> v. <u>Oklahoma</u>, 487 U.S. 815 (1988), which held that the Eighth Amendment prohibited the execution of a defendant convicted of a capital offense committed when the defendant was younger than 16 years old. <u>Roper</u>, 543 U.S. 570-71. <u>Roper</u> pointed to the <u>Thompson</u> Court's reliance on the significance of the distinctive characteristics of juveniles under the age of 16 and stated "We conclude the same reasoning applies to all juvenile offenders under 18." <u>Id</u>. This Court should look to the <u>Roper</u> Court's reliance on those same characteristics and

conclude that scientific developments since then indicate that the same reasoning also applies to all late-adolescents. See Appendix A, at 70-71.

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If this Court extends <u>Miller</u> to 18-year-olds based on the new scientific evidence, the societal evidence of national consensus and the hallmark characteristics of juveniles that make them less culpable, then it should also apply <u>Miller</u> to all late-adolescents. Extending <u>Miller</u> would not foreclose a court's ability to sentence late-adolescents in general to LWOP, but would require the sentencer to take into account how adolescents, including late-adolescents, are different, and how those differences counsel against irrevocably sentencing them to a lifetime in prison. See <u>Cruz</u>, at *71, and <u>Miller</u>, 567 U.S. at 480.

Amicus Curiae Scott therefore has an inherent interest in the extension of <u>Miller</u> and it's application to late-adolescents.

All the reasons Defendant Manning and Amici Curiae Legion, Scott and Byrd relied on to support the proposition that <u>Miller</u> should be extended to 18 year olds, apply with equal force to all late-adolescents.

RELIEF_REQUESTED

For the abovementioned reasons, Amici Curiae Legion, Scott and Byrd asks this Honorable Court to extend the holding in <u>Miller</u> to 18-year-olds, and exercise its inherent authority under MCR 7.316(A)(7) to extend <u>Miller</u> to all late-adolescents, aged 18-20 years old. Amici Curiae also asks this Court to hold that MCL §§ 750.316, 769.25 and 769.25a are unconstitutional as applied to Defendant Manning and all other late-adolescents.

Dote: SANUARY 14,2000

Submitted. Respectfully

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STATE OF MICHIGAN

IN THE SUPREME COURT

Appeal from the Michigan Court of Appeals Stephen L. Borrello, PJ., Amy Ronayne Krause, Brock A. Swartzle, JJ.

PEOPLE OF THE STATE OF MICHIGAN,

Plaintiff-Appellee,

Supreme Ct. No. 160034 CoA No. 345268 L/C No. 84-000570-FC

-VS-

ROBIN RICK MANNING,

Defendant-Appellant.

Saginaw County Prosecutor Attorney for Plaintiff 111 S. Michigan Ave. Saginaw, Michigan 48602

Brittany D. Parling P78870 Attorney for Defendant Jones Day 150 W. Jefferson Ave., Ste. 2100 Detroit, Michigan 48226

INDEX OF APPENDICES

- Appendix A: Dr. Laurence Steinberg's Testimony at Luis Cruz's 2017 Evidentiary Hearing
- Appendix B: Commonwealth v. Bredhold, Case No. 14-CR-161 (2017), unpublished opinion from a Kentucky trial court.
- Appendix C: Article entitled "Around the World, Adolescence is a Time of Heightened Sensation Seeking and Immature Self-Regulation, Developmental Science 00 (2017)."

Appendix A

Transcripts of Dr. Laurence Steinberg's Testimony at Luis Cruz's 2017 Evidentiary Hearing

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UNITED STATES DISTRICT COURT. 1 DISTRICT OF CONNECTICUT 2 3 LUIS NOEL CRUZ)September 13, 2017 4)1:25 p.m. Petitioner 5 v. }) 3:11cv787 (JCH) UNITED STATES OF AMERICA Respondent 6) 1 7 141 Church Street New Haven, Connecticut 8 9 HEARING 10 11 12 BEFORE: THE HONORABLE JANET C. HALL, U.S.D.J. 13 14 15 W. Theodore Koch , III FOR THE PETITIONER: P.O. Box 222 16 Niantic, CT 06357 17 Patricia Stolfi Collins FOR THE RESPONDENT: 18 John Trowbridge Pierpont William Nardini 19 United States Attorney Office 157 Church Street 20 New Haven, CT 06510 21 22 23 24 25

1 THE COURT: Good afternoon to you. We're here this 2 afternoon in the matter of Luis Noel Cruz versus the United States of America. 11CV787. If I can have appearances 3 4 please. 5 MS. COLLINS: Patricia Collins, John Pierpont and 6 William Nardini for the United States, Your Honor. Also 7 present in the courtroom in the first few rows is the White 8 family. 9 THE COURT: Thank you. Good afternoon to all of 10 you. 11 MR. KOCH: Good afternoon, Your Honor. Theodore 12 Koch for Mr. Cruz who is to my left. 13 THE COURT: Good afternoon to you, Attorney Koch and 14 good afternoon to you, Mr. Cruz. 15 We're here this afternoon for an evidentiary hearing on a 2255 petition filed by Mr. Cruz. My understanding is 16 17 we're ready to proceed to take the evidence, Attorney Koch. 18 MR. KOCH: Yes, Your Honor. We're ready. 19 THE COURT: If you would call your first witness. 20 MR. KOCH: Professor Laurence Steinberg. THE COURT: Professor Steinberg, if you would come 21 up to the witness stand. And when you arrive, I ask that you 22 23 remain standing so the clerk may administer an oath to you. LAURENCE STEINBERG 24 25 Having been called as a witness, was first duly

sworn and testified on his/her oath as follows: 1 2 THE CLERK: State your name for the record and spell 3 your last name. 4 THE WITNESS: Laurence Steinberg, Steinberg, 5 Philadelphia, Pennsylvania. THE COURT: You may be seated, Professor. Good 6 7 afternoon to you and whenever you are ready, Attorney Koch, 8 you may begin. 9 MR. KOCH: Thank you, Your Honor. DIRECT EXAMINATION 10 BY MR. KOCH: 11 12 Good afternoon, Professor Steinberg. 0. 13 A. Good afternoon. Can you tell the Court what's your present position? 14 Q. 15 I'm a professor of psychology at Temple University Α. 16 in Philadelphia. 17 0. Can you describe your educational background 18 starting with college? 19 Yes, I graduated from Vassar College with a Α. bachelors degree in psychology in 1974. I received my PhD in 20 21 developmental psychology from Cornell in 1977. 22 What previous professional positions have you held 0. 23 before being at Temple? I came to Temple in 1988. Prior to that, I was on 24 Α. 25 the faculty of the University of Wisconsin Madison and prior

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1 to that, I was on faculty of the University of California 2 Irvine. 3 Q. Can you summarize your publication credits starting 4 with the books that you published? 5 I've authored approximately 15 books, edited a Α. 6 couple of other books. I have published 400 or so research 7 articles, about 250 of those in peer review journals. 8 0. And scholarly articles are based on what research? 9 Whose research? 10 My research. Α. Are you on any editorial boards? 11 0. 12 Α. Yes. 13 Currently on three editorial boards. One for a 14 Journal of Psychology and Law, one for a Journal of 15 Neuroscience and one for a Journal of Psychology and Public 16 Policy. 17 THE COURT: Could I interupt you for a moment. 18 (Discussion Off the Record.) 19 Q. Professor Steinberg, what are your professional 20 memberships? 21 I'm currently a member of the Association for Α. 22 Psychological Science, the Society for Research on 23 Adolescence and the Society for Research on Child 24 Development. What major honors have you received? 25 0.

| 1 | A. I have received honors from the American |
|----|---|
| 2 | Psychological Association for contributions to the discipline |
| 3 | of psychology and are for contributions to public policy. I |
| 4 | have received lifetime achievement awards from the Society of |
| 5 | Research on Adolescence and Society for Adolescent Medicine. |
| 6 | I have been elected as a fellow to the American Academy of |
| 7 | Arts and Science and I was the first recipient of the |
| 8 | research prize given by a very large Swiss foundation several |
| 9 | years ago. |
| 10 | Q. Have you previously testified as an expert? |
| 11 | A. Yes, I have. |
| 12 | Q. Where? |
| 13 | A. I testified in state court in Kentucky, in state |
| 14 | court in Delaware, in federal court in Southern District of |
| 15 | New York, in state court in Pennsylvania, and before a Parole |
| 16 | Board in Arkansas. |
| 17 | Q. Have you ever been involved in the crafting of any |
| 18 | amicus briefs to the United States Supreme Court? |
| 19 | A. Yes. In the cases of Roper versus Simmons and |
| 20 | Graham versus Florida and Miller versus Alabama, I was the |
| 21 | lead scientist for the American Psychological Association in |
| 22 | drafting the amicus briefs filed with the court. |
| 23 | My responsibility there was to make sure that the |
| 24 | science of adolescent development was accurately represented |
| 25 | in the briefs filed by association. |
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1 Q. What would you say is your specific area of 2 expertise? 3 Α. Adolescence. 4 MR. KOCH: Your Honor, I ask that the court qualify 5 Professor Steinberg as an expert of adolescence. 6 THE COURT: I don't have any question about it. Ι 7 don't do that under the rules. I ask you to ask your 8 questions. If there is an objection to a particular 9 question, the Government thinks he's not qualified to answer 10 it, I'm sure that I will heard that objection. Otherwise I'm 11 assuming it won't be an issue. 12 Q. Thank you. Just from the start, Professor 13 Steinberg, can you give us your working definition for our 14 present purposes of adolescence? 15 I think of adolescence as the period spanning ages Α. 16 10 to up until 21. 17 What are some of the hallmark behavioral 0. 18 characteristics of adolescent as you defined them, as 19 compared to the adults? 20 Compared to adults, adolescents are more impulsive. Α. 21 They are more prone to engage in risky and reckless behavior. 22 They are more driven by reward relative to adults and less so 23 by punishment. They are more oriented toward the present and 24 less oriented toward the future and they are susceptible to 25 the influence of other people.

1 Q. Does the brain develop during adolescents? 2 Α. Yes, the brain continues to develop during this 3 period of adolescence. 4 0. For the purpose of this entire hearing, you're 5 defining adolescence as age 10 up to and including age 20? Α. 6 Yes. 7 0. Is the brain composed of various regions? 8 Α. The brain is composed of various regions. Yes. As 9 scientists, we would be more likely to describe the brain as composed of various systems because many brain systems 10 11 include multiple brain regions. 12 Q. Are certain regions or systems of the brain, 13 particularly significant during adolescence? 14 Α. Yes. 15 0. Which ones? 16 There's a brain system that we refer to as the Α. 17 cognitive control system. It is responsible for 18 self-regulation as well as advanced thinking abilities. That 19 includes mainly the prefrontal cortex of the brain and its 20 connections to other brain areas. 21 There's a second system that's important during 22 adolescence that's referred to as the limbic system. It is a deep structure of the brain. It is important in how we 23 24 process emotions and process social information and 25 experience reward and punishment.

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I apologize if you already did this. Can you just 1 0. describe the prefrontal cortex and its function? 2 The prefrontal cortex is the area of the brain 3 Α. that's located directly behind the forehead. It's mainly 4 responsible for advanced thinking abilities like logical 5 reasoning and planning ahead, but it's also responsible for 6 what psychologists refer to as self-regulation, the ability 7 to control our behavior and our thoughts and our emotions. 8 How did the limbic system and prefrontal cortex 9 0. 10 interact? We might think of the limbic system as kind of the 11 Α. emotional center of the brain and the prefrontal cortex as 12 the logical, rational center of the brain. Both systems are 13 active all the time. They can communicate with each other. 14 Although they don't communicate as well with each other 15 during adolescence as they do during adulthood, but in a 16 situation that one is making a decision and let's say the 17 situation is an emotional arousing one, the limbic system 18 will be responsible for the emotional arousal and the 19 prefrontal cortex will be responsible for the 20 self-regulation. 21 One way to think is the limbic system sometime 22 serves as an accelerator and the prefrontal cortex serves as 23 the brakes. 24 How is this interaction between these two systems 25 Q.

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| 1 | particularly significant during adolescence? |
|----|---|
| 2 | A. Well, at the beginning of adolescence until age 17 |
| 3 | or 18 or so, the limbic system becomes increasingly easily |
| 4 | aroused. We know that that happens primarily because of the |
| 5 | impact of puberty on the brain and the prefrontal cortex |
| 6 | develops very gradually over time so during middle and late |
| 7 | adolescence, you have what we call a maturational imbalance |
| 8 | between the systems because the limbic system is very easily |
| 9 | aroused, but the prefrontal cortex, the cognitive control |
| 10 | system is still immature, so very often arousal of the limbic |
| 11 | system can overwhelm what the cognitive control system is |
| 12 | capable of doing. |
| 13 | Q. Can you give us a definition of cognition please? |
| 14 | A. Cognition is a word that we use to refer to |
| 15 | thinking. |
| 16 | Q. Have you heard of the term hot cognition versus cold |
| 17 | cognition? |
| 18 | A. Yes, I have. |
| 19 | Q. Can you describe to us the differences between those |
| 20 | two please? |
| 21 | A. When we're making decisions about things, sometimes |
| 22 | we make them under situations that are very arousing, maybe |
| 23 | we're angry or we're enthusiastic or we're with other people |
| 24 | who arouse our emotions, and we refer to that situation as |
| 25 | the thinking in that situation as hot cognition. That can be |
| | |

1 contrasted with situations which are very calm when we're by 2 ourselves. When we're not emotionally aroused and we refer to that as cold cognition. To give you an example, if 3 4 somebody in a research study of mine is filling out a questionnaire, let's say I put that person in a room by 5 6 herself. There's nothing to make her emotionally aroused either positively or negatively and the situation is calm and 7 8 neutral, she would be using cold cognition when she 9 completed that questionnaire. If I took the same person and 10 administered the same questionnaire to her after making her afraid or after making her angry or surrounding her with a 11 12 group of other people who are urging her to do something or to not do something, filling out that questionnaire under 13 that circumstance would be considered an example of hot 14 15 cognition. 16 0. How is the difference between hot cognition and cold cognition salient to adolescence? 17 18 Α. Cold cognition relies mainly on basic thinking abilities that are in place and are mature by the time we're 19 16 or so. Hot cognition relies both on those abilities but 20 also on our capacity to regulate and control our emotions. 21 We have all had the experience of trying to make a 22 decision when we're upset. We know that our 23 decision-making abilities under that circumstance are not as 24 good as they are when we're making the same decision when 25

1 we're calm, and we know that the capacities necessary for good decision-making in hot situations or hot cognition are 2 still immature during adolescence and aren't fully mature 3 until the early or to the midtwenties. 4 5 0. Are there different phases of development within 6 adolescence? The scientists who study adolescence would often 7 Α. divide the period into three phases: early adolescence, let's 8 9 say approximately from 10 to 13, middle adolescence, approximately 14 to 17, and late adolescence, approximately 10 18 to 21. 11 Just basically what are the different 12 Q. characteristics of each of those three phases of development 13 14 within adolescence? The Government is not going to 15 MR. PIERPONT: object at this point. Can I have a moment with counsel 16 please? 17 THE COURT: Sure. 18 19 MR. PIERPONT: Thank you, Your Honor. THE COURT: Do you want the question read? 20 (Question read by the Court.) 21 Well, there are many differences between the early, 22 Α. middle and late phases but I assume that you would like me to 23 connect this to what we were discussing about hot and cold 24 cognition. During early adolescence both types of thinking 25

are still immature. Early adolescence compared to adults are
 not as good in cold cognitive abilities and they are not as
 good in hot cognitive abilities.

During middle adolescence, there are very few 4 differences between adolescence and adults in their cold 5 cognitive abilities, but they are still immature with respect 6 7 to their hot cognitive abilities. That is also true during late adolescence. They are a little bit better. They still 8 are not as good as adults are in the area of hot cognition, 9 but they certainly would be comparable to adults in the area 10 of cold cognition. 11

12 Q. Do you have an opinion as to when psychological and13 neurobiological maturity is attained?

The answer to that question is complicated because 14 Α. different parts of the brain mature along different time 15 tables. And therefore, the psychological abilities that 16 those parts of the brain govern mature along different time 17 tables. If what you mean by your question is when is 18 everything completed in all systems of brain both with 19 respect to psychological functioning as well as brain 20 development, I think the concessions would be that this is 21 not the case until people are maybe 22 or 23 years old. 22 What's the basis of your opinion? 23 Q. There have been studies, my own as well those of 24 Α. other scientists, that have administered psychological tests 25

to people in this age range and have asked at what point do 1 these abilities that are being measured stop improving. 2 There are brain studies that use brain imaging to look at 3 changes in the brain's anatomy and changes in the way the 4 brain functions that also have been done with people of 5 different ages and they have also asked at what point do we 6 no longer see major changes in the anatomy of the brain or in 7 the way that the brain functions. 8 I want to turn now to the specific 9 0. characteristics of the late adolescence or what you have said 10 is 18, 19, and 20-year-olds. 18, 19, and 20-year-olds just 11 to be clear, do they fall within your definition of 12 adolescence? 13 14 Α. Yes. Can you just backing up describe the history of 15 0. research on adolescent brain development specifically as it 16 relates ultimately to late adolescence? 17 Sure. Until the 1990s, it was assumed that the 18 Α. brain was fully developed by the time we were 10 or 19 11-years-old. That's because the brain reaches its adult 20 size by that age. So if you measured the volume of the 21 brain, you wouldn't see big differences after that age in 22 terms of its growth. It wasn't until the advent of brain 23 imaging technology like MRI technology that scientists were 24 able to look inside the living brain. Obviously it was 25

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possible to do an autopsy, cut open the brain and look at it. 1 When you do that, you can't see how the brain functions. 2 You can only look at the anatomy of the brain. It wasn't until 3 there was FMRI and brain imaging that scientists could look 4 at the living brain and see what's going on inside when it 5 was at work. Studies that began to be done during the late 6 1990s illustrated that the brain was continuing to change 7 during adolescence in ways that weren't visible by looking at 8 the exterior of the brain. This was not known. And the 9 first published studies of how the brain was changing during 10 adolescence didn't really appear until about the year 2000 so 11 relatively recently in terms of the history of science, 12 13 history of the study of development.

During the period, let's say from 2000 into the middle or latter part of the decade, most of the research on adolescence brain development focused on people who were 18 and younger. There was to my knowledge virtually no research that went past that age and that looked at brain development during late adolescence or young adulthood.

People began to do research on that period of time toward the end of that decade and as we moved into 2010 and beyond, there began to accumulate some research on development in the brain beyond age 18, so we didn't know a great deal about brain development during late adolescence until much more recently.

Okay. I would like to show you what I have 1 0. previously marked as Petitioner's Exhibit for Identification 2 One. I have shared this with the Government. May I 3 4 approach, Your Honor? 5 THE COURT: You may. That's an article titled "Young Adulthood as a 6 0. Transitional Legal Category: Science, Social Change and 7 Justice Policy" by yourself. Just briefly can you tell us 8 what's the central point of that article? 9 The central point of that article is that recent 10 Α. discoveries in psychological science and in brain science as 11 well as changes in society, should ask us to rethink how we 12 view people in the late adolescence period and even to the 13 young adult period in terms of their treatment under the law 14 15 because a lot of the --MR. PIERPONT: Your Honor, the Government is going 16 to object to the answer at this point. We understand that 17 Professor Steinberg is here to talk about brain sciences, but 18 to the extent we start to get to policy and how people should 19 be treated under the law, that goes a little further upfield 20 of what the Government expected testimony to be about here 21 22 today. THE COURT: I will let the answer stand to the point 23 of the objection. I understand it is summarizing the point 24 of an article. I think the Government's objection has some 25

legs in the sense that he isn't here to tell us about what 1 the policy of the law should be. He's here to tell us what 2 might be a basis for law makers or courts to change. 3 Let me ask you this: Does that article reliably 4 0. present the scientific knowledge as regards to late 5 adolescence as of the present moment? 6 Yes. And that was the part of the article that I 7 Α. was responsible for writing. 8 Okay. I would like to offer that as an exhibit at 9 Q. this time, Your Honor. 10 MR. PIERPONT: Your Honor, the Government -- I have 11 spoken to Attorney Koch about this. The Government is not 12 going to object again to the extent that it is being offered 13 for the extent of what the current science is. If there was 14 a jury here, we might have some concerns about the policy 15 decisions, but with the understanding that the reason and 16 limited reason it is being offered, the Government does not 17 have an objection. 18 THE COURT: Do I fairly understand, Professor, that 19 if I read this article, I will be informed to the extent that 20 you understand it, the extent of scientific knowledge studies 21 that have been undertaken, et cetera, in the area of late 22 adolescence up to the time the article was written? 23 THE WITNESS: Yes, Your Honor. 24 THE COURT: Then on that basis, I will accept it. 25

1 MR. KOCH: Thank you, Your Honor. 2 THE COURT: Exhibit 1 is a full exhibit, Diahann. MR. PIERPONT: Thank you. 3 4 BY MR. KOCH: 5 Q. Now I'm going to show you what's previously been marked for identification as Exhibit 2 which is an article 6 7 entitle "When does a juvenile become an adult? Implications 8 of law and policy." If I may approach, Your Honor. 9 'THE COURT: You may. 10 Do you recognize that article? Q. Yes, 1 do. 11 Α. I will cut right to the main question. Does that 12 Q. 13 article, like the first one, reliably present the scientific 14 knowledge as to late adolescence as of the present moment? 15 Yes, it does. Α. 16 MR. KOCH: I would offer that, Your Honor, for the 17 same purposes of the previous article. 18 MR. PIERPONT: Again, Your Honor, subject to the same discussion that I had previously with the Court to the extent 19 20 there's science in here, there's no objection. The 21 Government does think to the extent there's policy discussions and things along those lines, it is beyond what 22 23 we're here to do today. 24 THE COURT: Is your offer -- do you have any objection to how the Government frames their lack of 25

1 objection to the purpose of the article? 2 MR. KOCH: No, Your Honor. That's in accordance 3 with our agreement. 4 THE COURT: For example, there's a summary at the 5 beginning of this article, it says at the end in this 6 article, we summarized recent behavioral and neurological 7 findings on cognitive capacity in young adults. That's what 8 you are offering it for as opposed to and highlight several 9 ways which they bear on legal policies. That's the thrust of 10 your offer is the second part? 11 MR. KOCH: Correct. 12 THE COURT: That's fine then. Exhibit 2 is received 13 as a full exhibit with that understanding. 14 BY MR. KOCH: 15 Q. About those articles, is there any question or 16 debate in the scientific community about the findings in 17 these articles? 18 Α. No. 19 THE COURT: May I inquire as to where they were 20 published. Before you add to your answer, could you tell me. 21 One is Fordham Law Review. THE WITNESS: I believe the other is Temple Law 22 23 Review. 24 THE COURT: Thank you. 25 Well, in accord with the back and forth questioning, A.

1 I will limit my answer to your question with respect to the 2 scientific findings that are discussed in the article rather than the policy implications, but there's broad consensus 3 among scientists with respect to the scientific information 4 5 that's contained in each of these articles. Thank you. Are there ways in which the brains and 6 Q. 7 behavior of 18 to 20-year-olds are similar to adults? 8 A. Yes. 9 0. Can you describe some of those similarities with 10 adults? 11 As we were discussing earlier, with respect to Α. 12 behaviors that we might think of as cold cognitive driven so 13 things like logical reasoning or the ability to solve 14 problems under neutral nonarousing situations, people that 15 age period perform just as well as adults do. 16 Are there any ways in which the brain's behavior of Q. 17 18 to 20-year-olds are more similar to younger adolescence 18 than they were to adults? 19 There is still immaturity in certain brain systems Α. 20 in the behaviors that those brain systems govern, so during this age period, late adolescence relative to adults, still 21 show problems with impulse control and self-regulation and 22 23 heightened sensation seeking which would make them in those respects more similar to somewhat younger people than to 24 25 older people.

Q. Thank you. I want to go down a few characteristics of adolescence and ask you for each one of these whether late adolescence are more similar to younger adolescence or to adults. In terms of risk-taking, when does risk-taking peak on average?

6 Α. Well, it depends on the specific type of risk-taking 7 that you are talking about, but in general, people in the 8 late adolescent years are more likely to take risks than 9 people who are adults and more likely to take risks than 10 young adolescents are to, so if you were to -- if you were to 11 draw a graph showing the prevalence of risk-taking by age, it 12 would look like an upside down U. The peak would be 13 somewhere, you know, around 17, 18, 19, approximately that 14 age range. That's when most type of risky behavior are at 15 their height.

Q. What about impulsivity?

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17 Impulsivity is still developing during the late Α. 18 adolescent years. I'm sorry. Correct that. Impulse control 19 is still developing during the late adolescent years, so if 20 you were to draw a graph of that, you would see a straight 21 upward trending line that goes from age 10 to age 25 or so. 22 Q. How about susceptibility to the influence of one's 23 peers? 24 Α. Susceptibility to peers is higher during late

adolescence than it is in adulthood. It is slightly lower

1 than it is during middle adolescence, but it is -- but the 2 ability to resist peer pressure is developing during the late 3 adolescent years.

Q. What about the capacity for change?

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5 Α. We think that people are more amenable to change 6 when they're younger than when they're older. We think that 7 people are still capable of change -- are more capable of change when they're in their late adolescent years than when 8 9 they're adults. That would be supported by personality 10 research that shows that more changes are taking place during 11 that time than if you were looking at people who were in 12 their late 20s, 30s or 40s.

13 Q. With regards to reward-seeking behavior, is the 14 prefrontal cortex everything in terms of regulating that when 15 it comes to rewards?

16 A. No. Because reward-seeking is a combination of an 17 urge to go after a reward and the ability to put the reins on 18 that urge. So in order to understand reward-seeking at a 19 given age, you have to ask both about how the prefrontal 20 cortex is functioning, but also about the arousal of the 21 limbic system that might lead to reward-seeking.

I think I said before, but it is worth repeating, that the metaphor that I and other scientists use to describe this is having the accelerator pressed down without a good braking system in place. That would be true of mid

1 adolescence as well as late adolescence. 2 In 2003, you co-wrote an article called "Less Guilty Q. By Reason of Adolescence, correct? 3 4 Α. Correct. 5 Just tell us in terms of the psychology and not in Q. terms of the policy, what was the central point of that 6 7 article? 8 Α. The central point of the article that adolescents 9 compared to adults are more impetuous. They are more susceptible to peer pressure and their personalities are less 10 11 fully formed. 12 Q. How has the research changed since you wrote that 13 article? 14 I think that the conclusions are still the same Α. 15 today as they were then. 16 Q. If you were writing that article today, what age 17 range would you apply it to? 18 Α. I think I would apply it to the whole adolescent 19 period. At that time, we wrote that article because of 20 interest and debate at that point about the juvenile death 21 penalty. The focus of the article was about people younger 22 than 18. If we were writing it today, I think we would say 23 that the same things are true about people who are younger 24 than 21. 25 Q. Is there any question today among the scientific

community that late adolescence as a group possessed the same 1 2 hallmarks traits of youth that you ascribed to middle 3 adolescence in 2003? 4 Α. They possess many of the same traits. 5 I want to turn now. This would be the last section. 0. 6 A few questions about the various features of 18 to 7 20-year-olds. 8 Are there specific characteristics of this group 9 that emerge when they are in unsupervised groups of their 10 peers? 11 MR. PIERPONT: A little bit of feedback. I missed 12 the middle part of that question. 13 Α. Your Honor, I'm wearing hearing aids. I wonder if 14 the microphones in those hearing aids are giving some 15 feedback. 16 THE COURT: It is not you. You are fine. It is 17 Attorney Koch keeps getting a buzz. 18 MR. KOCH: I have been hearing that the whole time. 19 I could turn microphone off and yell. 20 THE COURT: No, you will hear it and I will hear it. 21 He might hear it. Nobody behind you would hear it. That's 22 not a good outcome. 23 MR. KOCH: This sounds better to me. 24 THE COURT: I think that's fine. You better put the 25 question again.

1 BY MR. KOCH:

Q. Are there specific characteristics of 18 to
20-year-olds that emerge when they were in unsupervised
groups of their peers?

A. Yes.

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Q. What are they?

A. In general, when people that age are with their peers and where there are no adults present, it makes them even more inclined to take risks, and it makes them even more reward-seeking than when they are by themselves. This actually is one of the main focuses of the research that my team at Temple University has been doing for the last 15 years.

14 Q. Tell me about what kind of studies have you been 15 doing on that?

16 Well, in a series of studies, we invite research Α. 17 participants to come to our lab. We invite them to come with 18 one or two friends, then we randomly assign the people in the 19 study to take a test battery either by themselves or with 20 their friends watching them. In some of the experiments, the 21 friends are in the room with them. In some of the 22 experiments, the friends are in an adjacent room, but they 23 can watch the subject's performance on a monitor.

In some of the studies, the person we're testing is
inside a brain imaging machine. The friends would be also in

1 an adjacent room watching the subject's performance on a 2 monitor. And we administer a series of different kinds of 3 tests, some risk-taking tests, some reward-sensitivity tests, 4 some cognitive-control tests, then we compare how people 5 respond when they're alone versus how they respond when 6 they're in the presence of their peers.

7 We have done this with people of different ages, then we can ask is the effect of being around your peers 8 9 different, if you are an adolescent than if you are an adult. What we have found, as I said before, is that when people are 10 11 in the presence of their peers, up until about age 24 or so, 12 we get this peer effect where it increases their risk-taking 13 and reward-sensitivity, and we don't see that effect after 14 age 24 where adults perform the same way when they are by 15 themselves as when they are in a group.

Q. Have you ever used the term "the social brain"?A. I have.

Q. What does that mean?

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19MR. PIERPONT: Your Honor, may I have one more20moment with Attorney Koch?

Thank you, Your Honor.

22 Q. What does the social brain mean?

A. The social brain is a term that is used to refer to
a brain system that is important for how we perceive other
people and how we judge their opinions of us as well as

their -- as well as their emotions and their facial
 expressions and so on.

Q. Are adolescents particularly -- are late adolescents
4 particularly concerned with their social status?

A. Yes.

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Q. How so?

7 Α. Well, the social brain becomes more active during 8 adolescence, then it becomes less active as we mature into adulthood. What that does is it makes adolescents, including 9 10 late adolescents more sensitive to their standing in a social group, more sensitive to the impressions that they make on 11 12 other people, more sensitive to the opinions that other 13 people have of them, and therefore, we think that explains 14 why compared to adults, adolescents are more likely to change 15 their behavior when they are with other -- when they are with 16 their peers. Whereas adults are more consistent when they 17 are alone and when they are with their peers.

18 Q. Is an immature, late adolescent different from an 19 immature adult?

A. Maybe in the following way. As I said before, we think that the brain has matured by the time people are 22 or 23-years-old. What that means is that somebody who is younger than that who is immature still might become more mature over time. Whereas somebody who is immature who is 30 let's say is probably never going to be very mature because

the parts of the brain that are still -- that regulate these 1 kinds of behaviors are done. They are done developing. 2 So 3 of course, with somebody who is younger, you don't know what 4 the future is going to hold. We do believe that the vast 5 majority of people that show immaturity during adolescence 6 grow up to be mature adults, but we know that there are some 7 immature adults so obviously not all of them do. 8 Q. Do late adolescents know right from wrong? 9 Α. Sure. 10 Q. So how is it consistent to know right from wrong yet 11 be less responsible by reason of adolescence? 12 Well, by asking about being less responsible, I want Α. 13 to restrict my answer to less responsible psychologically and make sure I'm not talking about less responsible legally so 14 15 we don't get into areas that are beyond my expertise. By less responsible, I mean less able to control their own 16 17 behavior. 18 Is it possible, using the MRI studies that you Q. 19 mentioned earlier, to conclude that any given adolescent has 20 attained psychological and neurobiological maturity? 21 Α. No. 22 Q. Why not? 23 Α. We don't have the precision that would be necessary 24 to do that and we don't -- I'm not even sure we would know 25 exactly what to look for.

Most of the MRI studies that are done talk about averages of people of different ages. It is not yet -- we can do a brain scan of somebody and we can say whether he has a tumor or whether he has a lesion in his brain, but we can't look at an individual brain and say is this more like an adolescent brain or more like an adult brain. We're just not there yet.

8 Q. I think you mentioned earlier that adolescents are
9 more sensitive to rewards and less sentence to penalties,
10 correct?

A. Correct.

11

Q. Is the harshness of a penalty likely to impact on the decision-making of a late adolescent who is making decisions in the decision-making of hot cognition?

MR. PIERPONT: The Government objects. We're talking about the harshness of penalties. We seem to be getting astray of the scientific underpinnings that Dr. Steinberg is to testify about today.

19 THE COURT: If he can't answer it, he can tell me 20 that. If he can, I think it is not impermissible in the 21 context of his prior testimony because he talked about hot 22 cognition, making decisions, being more reward focused than 23 risk focused and penalty to me is a risk, so if you can 24 answer the question in that context and just in the sense of 25 greater risk meaning greater penalty without a particular 1 penalty.

| 2 | TE was such by South States |
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| 2 | II you want to put a further question as to a |
| 3 | particular penalty, you can do that later. If you can get me |
| 4 | this far with that answer, sir. If you can't answer it, then |
| 5 | maybe the objection is well taken, but I will let you answer. |
| 6 | A. I can answer and I understand the distinction that |
| 7 | you are drawing. I think that whenever we're making a |
| 8 | decision that has some risk involved, we're always weighing |
| 9 | the cost and benefits of different courses of action. To the |
| 10 | extent that a potential penalty or a punishment for doing |
| 11 | something is salient, we're less likely to take the risk |
| 12 | because we get worried that we're going to be punished. |
| 13 | But under conditions of emotional arousal when hot |
| 14 | cognition is operating, adolescents are less likely to pay |
| 15 | attention to the downside of a risky decision, and they're |
| 16 | more focused on the rewards of it, so it means that the |
| 17 | prospect of being punished for something and I mean |
| 18 | punishment not in a legal sense, like getting a shock in a |
| 19 | psychological experiment, the prospect of being punished for |
| 20 | something is less salient to an adolescent than it is to an |
| 21 | adult. |
| 22 | In psychological research on deterrence, that |
| 23 | evidence has been used to argue that this is why kids are |
| 24 | less likely to be deterred by the knowledge that something |
| 25 | bad can happen to them because they are not paying attention |
1 to it the way they would pay attention to it under the 2 condition of cold cognition. 3 You mentioned that the research on this really got Q. going in the nineties. Is there anything indicating that 4 5 adolescent brains in the 90s or 80s would be any different 6 than adolescent brains today? 7 Α. No. 8 0. Has your research been replicated in other parts of 9 the world? 10 Α. Yes. 11 Q. Let me ask more specifically. Are adolescents in other countries and cultures falling into these same research 12 13 findings that you have had? 14 Well, we recently completed a study of 5,000 people Α. 15 mail in 11 countries, countries that were very different from 16 each other. Some in Europe, some in Africa, some in Asia, 17 some in the Middle East and some in North and South 18 America. 19 We looked at the two age patterns that I talked 20 about before, this upside down U for reward-seeking, 21 sensation-seeking and we found the same upside down U in 22 other parts of the world as we have found in American 23 samples. 24 We also looked at this gradual increase in 25 self-control that I described before, and we also found that

1 in other parts of the world as we have in American samples 2 with the improvements in self-control going on until people were in their midtwenties. 3 4 0. That upside down U, I believe you had mentioned that 5 in the risk-taking context? 6 Α. Yes. 7 Q. Age 17 to 19? 8 Α. Yes. 9 MR. KOCH: I have nothing further, Your Honor. 10 THE COURT: Thank you. For the Government please on 11 cross-examination. 12 MR. PIERPONT: Your Honor, it is my intention to go through at least one of the exhibits that Attorney Koch 13 14 introduced so I brought this laptop. I will also point out I 15 have a couple other documents from which I plan to read. I 16 don't intend to introduce them as exhibits. To the extent it 17 would be helpful to the Court to take a look and Attorney 18 Koch to take a look, maybe we can use the Sanction system and 19 publish them on the screen for the Court and Attorney Koch. 20 THE COURT: That's fine. 21 CROSS-EXAMINATION 22 BY MR. PIERPONT: 23 Q. Professor Steinberg, good afternoon. 24 Α. Good afternoon. 25 0. I would like to talk a little bit maybe just to

1 clarify about the breakdown of age definitions between 2 adolescents and young adults, just to make sure we're on the 3 same page. 4 To be clear, I know there's been a little bit of 5 question about this, when you say adolescence here today, you 6 are defining it as the age from 10 to 20. That's inclusive 7 all the way up to somebody who is about to turn 21. Is that 8 fair so say? 9 Α. Yes. As you testified previously, it could be further 10 0. 11 subdivided young adolescence or early adolescence is 10 to 12 14, is that right? 13 Α. I said 10 to 13. 14 0. 10 to 13 Middle adolescence maybe 13 to 17 area, is 15 that fair to say? 16 Α. 14 to 17. 17 Late adolescence being this 18 to 20 range that Q. 18 we're talking about today? 19 Α. Right. 20 Q. These boundaries have been fairly consistent for the 21 last five years, is that fair to say? 22 Α. Yes, with the caveat that they are just labels and 23 just as, you know, here, you might say 10 to 14 and I might 24 say 10 to 13. There's nothing -- these are labels that 25 scientists use, but if I was speaking to other people who

study adolescent development, I think they would use similar 1 2 labels and similar cut points. 3 Q. Put differently, five years ago people weren't 4 saying middle adolescence was a 13-year-old or 12-year-old? 5 Not as far as I know. Α. 6 0. Those categories generally have been consistent for 7 the last five years? 8 Α. Yeah. 9 Q. There's some overlap between what's referred to in 10 the literature as late adolescence and young adult as well, 11 is that fair to say? 12 Α. It's a term of logical overlap. Some people might use young adult to refer to people who are, you know, 18 to 13 14 24 or something like that. Other people might use it only to 15 refer to people who are 21 to 24. 16 0. And in some of your own work, you have looked at 17 young adulthood and even talked about it in the context of 18 18 to 21 that being the category. Is that fair to say? 19 I'm not sure. I have a textbook on adolescence and Α. 20 I use the age ranges that I spoke about earlier in that. Ι 21 am not sure what you are referring to. 22 Let me bring up Defendant's Exhibit 1 then and this Q. 23 is a full exhibit that was just introduced. This is the 24 "Young Adulthood as a Transitional Legal Category: Science, 25 Social Change and Justice Policy article.

1 THE COURT: That's Petitioner's 2. 2 MR. PIERPONT: I'm sorry. That's right. 3 Q. Doctor, you should be able to see it on the screen 4 in front of you as well. 5 THE COURT: You have to enlarge that. 6 Α. I have a copy of that in front of me. 7 THE COURT: I do, too, but he's going to direct you 8 to particular pages, Professor. He's at 645. 9 Α. When you enlarge it, I can read it fine. 10 0. I will take you to page 645, as the Court said. Do 11 you prefer Professor or Doctor? 12 Α. Either. 13 Q. If you go to page 645, there's some discussion in 14 this article. This is an article that you co-authored, is 15 that right? 16 Α. Yes. 17 ο. I will direct you to one sentence there that's 18 highlighted. It says "Although 18 to 21-year-olds are in 19 some ways similar to individuals in their midtwenties, in 20 other ways, young adults are more like adolescents in their behavior." 21 22 Fair to say that that sort of suggests that by young 23 adults, at least in this article, you are talking about 18 to 24 21-year-olds? 25 Α. Yes. And that's because the two other authors of

this article are law professors and this article stemmed from 1 2 questioning the boundary that the law draws and the law draws 3 the boundary at 18 and so in legal parlance, it would be 4 appropriate to refer to those people as young adults. 5 Q. I don't want to go too far down there, but for the 6 purposes of this article, when you are saying young adults, 7 you mean young adults from the ages of 18 to 21 as opposed to 8 something earlier than that or something later than that age range? 9 10 Α. I believe so, yes. 11 0. I would like to talk a little about this idea of 12 late maturation in the brain in areas affecting judgment and 13 decision-making. You testified about that on direct not that long ago. Do you remember that? 14 15 Α. Yes, I do. 16 Q. And we heard you testify that part of the brain such 17 as the prefrontal cortex, that's sort of responsible for some 18 of the controlling of the impulses and sort of the CEO, the decision-maker of the brain. You testified along those 19 20 lines? 21 Α. Yes. 22 Q. And that the limbic system is the emotional reaction 23 part of the brain that the cortex helps control and rein in. 24 Is that fair to say? 25 Α. Roughly.

1 Q. You were, as you testified, the lead scientific 2 consultant for the American Psychological Association amicus brief in Miller, right? 3 4 Α. Yes. 5 Q. As you I think testified on direct, you consulted on 6 the science that was presented to the Supreme Court in that 7 brief. Is that fair to say? 8 Α. Yes. 9 Q. It was your job to make sure the science was 10 accurate, is that right? 11 Α. Yes. 12 Q. Were you familiar as well with other scientific briefs submitted to the court in that context? 13 14 Α. In Miller? I don't recall. It was sometime ago. 15 Q. How about a brief by J. Lawrence Aber? 16 Aber, yes. I don't remember the contents of it, but Α. 17 I know that he was a co-author of another brief. 18 MR. PIERPONT: Your Honor, I'm going to pull up that 19 brief. That's for the convenience of Attorney Koch and the 20 Court. I don't plan on introducing it as an exhibit. 21 THE COURT: What will it be marked for I.D.? 22 MR. PIERPONT: Government's 1 for identification 23 purposes. I don't know, Your Honor, if you want to take it 24 down from the screen up there or. 25 THE COURT: I'm sorry.

1 MR. PIERPONT: I don't know if you would like to take 2 it down from the screen up there. 3 THE COURT: Why? 4 MR. PIERPONT? As it stands right now, if I were to 5 pull it out, it would be going to the entire courtroom and 6 the witness. 7 THE COURT: It is a public document unless you don't 8 want me to look at it. 9 MR. PIERPONT: No, Your Honor. I'm just pointing it 10 out to you. 11 THE COURT: Yup, go ahead. 12 Q. So in the APA brief on which you were the lead 13 scientific consultant, the brief stated, it is now and I'm 14 quoting. "It is now well established that the brain 15 continues to develop throughout adolescence and young 16 adulthood in precisely the areas and systems that are 17 regarded as most involved in impulse control, planning and 18 self-regulation." You see where it says that, right? 19 Α. I do. 20 That is similar to the testimony that you have given 0. 21 here today? 22 Α. Yes, it is. 23 Q. As the lead scientific consultant, you believed it 24 was accurate at the time that it was in this brief as well, 25 right?

A. Yes.

| Q. Excuse me for one moment. I'm going to go to the |
|--|
| thirteenth page of Government's Exhibit 1. I'm going to |
| direct you to the bottom of the thirteenth page of |
| Government's Exhibit 1 for identification purposes. |
| It reads, "Well into late adolescence, there's an |
| increase in connections not only among cortical areas, but |
| between cortical and subcortical regions that are especially |
| important for emotion regulation." Are we talking there |
| about in part the prefrontal cortex and the limbic system |
| that you had spoken about previously? |
| A. Precisely. |
| Q. It continues to read "As the brain matures, that |
| self-regulation is facilitated by the increase connectivity |
| between regions important in the process of emotional and |
| social information and reducing important in cognitive |
| control processes." Do you see that? |
| A. Yes, I do. |
| Q. That's expanding further upon the idea that as the |
| interconnectivity between the frontal cortex and the limbic |
| system as that develops, an individual gains greater control |
| in order to check their emotional reactions; is that right? |
| A. Yes. |
| Q. It continues to say, "This developmental pattern is |
| consistent with adults' superior ability to make mature |
| |

1 judgments about risk and reward and to exercise cognitive 2 control over their emotional impulses especially in circumstances that adolescents would react to as socially 3 charged." 4 5 So there we're talking a little bit about adolescence maybe in the hot cognitive state and the contrast 6 7 between somebody who is in their late adolescence as opposed 8 to an adult, right? 9 I believe so. I don't know the exact context of A. 10 this, but that's how I read it. 11 Let me go back one page and just bring you to the 0. 12 --give you the context to bring you to the beginning of the 13 particular paragraph. It says well into late adolescence 14 there, right? 15 Α. Yes. But I don't know. This is not a paper that I 16 wrote. I don't know what these authors are using as their 17 definition of well into late adolescence. 18 Q. You were the scientific consultant on this brief, 19 though, right? 20 Α. Is this our paper or is this the Aber paper? 21 0. I'm sorry. This is the American Psychological 22 Association. 23 Α. Yes. 24 Late adolescence there you understand that to be Q. 25 talking about the context of 18 and older. Is that fair to

1 say? 2 Α. Yes. I believe so. We're talking about a brief 3 that was written -- which brief is this, by the way? 4 Q. This is the American Psychological Association. 5 Α. For which case? 6 0. For Miller. 7 Α. So this is a brief that is now seven years old. 8 Q. Maybe five years old. 9 Α. Five years old. Miller was decided in 2012 but 10 yup. 11 Q. So somewhere between five and seven years old this 12 brief was? 13 Α. Right. 14 To be clear maybe we'll go to the fourteenth page of Q. what's been previously marked as Government's Exhibit 1 and 15 16 in this brief, middle adolescence is defined as roughly 14 to 17 17, right? 18 Α. Yes. 19 Q. Elsewhere where it talks about late adolescence, 20 fair to concluded that we're talking about people who are 21 older than 17. Is that fair? 22 Α. Correct. 23 Q. Going back to the fourteenth page of what's been 24 previously marked Government's Exhibit 1, there's a sentence 25 that reads "Studies have shown that the prefrontal cortex is

1 among the last areas in the brain to mature fully." Do you 2 see that, right? 3 Α. I do. 4 That's consistent with your testimony here today Q. 5 about the prefrontal cortex developing much later ____ withdrawn. Let me make sure I get it right. 6 7 That's consistent with your testimony earlier today 8 that prefrontal cortex development continues into an 9 individual's 20s. Is that fair to say? 10 Α. Yes. Yes, if you include the connections between 11 the prefrontal cortex and other brain regions. 12 Q. For instance, including the limbic system, right? 13 Α. Yes. 14 0. So I'm going to also bring up -- Your Honor, 15 let's -- I'm going to bring up another exhibit that we can 16 call Government Exhibit 2 for identification purposes. This is the Aber brief. I will take you to two things there. 17 18 THE COURT: Aber? 19 MR. PIERPONT: Aber, A-b-e-r. 20 Q. This was a brief submitted to Miller, right? 21 Submitted in Miller. 22 Α. That's what it says here. 23 0. So let's take a look at the eleventh page. And here 24 it reads "Since Graham, studies continue to confirm that the 25 prefrontal cortex is among the last regions of the brain to

1 mature. In fact, the prefrontal cortex is not fully mature 2 until an individual reaches his or her 20s." Do you see that 3 language there? I do. 4 Α. 5 And that was consistent with your testimony here 0. 6 earlier today with the caveat that we're talking about 7 interconnectivity between the limbic system and the 8 prefrontal cortex, right? 9 Α. Yes. That's consistent with what was in your brief that 10 0. 11 was presented to Miller as well, right? 12 Α. Yes. 13 Q. We focused a little bit on the limbic system. I think I've mentioned it in passing a couple of times, but I 14 15 want to hone on it a little bit more here. You testified 16 that the limbic system is the emotionally charged part of the 17 brain, that the prefrontal cortex doesn't gain more control 18 over until an individual is in their 20s, right? 19 Α. Yes. 20 Q. Do you recall writing in 2008, a paper called A 21 Social Neuroscience Perspective on Adolescent Risk-taking in 22 Developmental Review? 23 Α. I do. 24 MR. PIERPONT: Your Honor, I have that. I would 25 like to, for identification purposes, call that Government's

Exhibit 3. And Your Honor, I have paper copies if you prefer 1 2 if it would be easier for the court to have. 3 THE COURT: I can't read it on the screen. Attorney Koch, would you prefer that I have a paper copy? 4 5 MR. KOCH: I have no preference. 6 THE COURT: Somehow the clerk has to end up with a 7 copy. 8 MR. PIERPONT: Why don't I bring up a couple paper 9 copies for the Court at this point. BY MR. PIERPONT: 10 I would direct you, Professor, to the fourteenth 11 Q. 12 page of what's been previously marked Government's Exhibit 3. 13 I'm going to read what it says here. There's a discussion 14 about the decline in risky activity after adolescence and 15 after going through a little bit before, you write, "A more 16 likely, although not mutually exclusive, cause of the decline 17 of risky activity after adolescence concerns the development 18 of self-regulatory capacities that occur over the course of adolescence and during the 20's." Do you see that? 19 20 Α. I do. 21 This is consistent with your testimony here earlier Q. 22 today that we have been talking about with the prefrontal 23 cortex exerting control over the limbic system? 24 Α. I believe so. 25 In fact, if you continue to read later in that Q.

| 1 | paragraph, you write "The maturation of this cognitive |
|----|---|
| 2 | control system during adolescence is likely a primary |
| 3 | contributor to the decline in risk-taking seen between |
| 4 | adolescence and adulthood. This account is consistent with |
| 5 | the growing body of work on structural and functional changes |
| 6 | in the prefrontal cortex which plays a substantial role in |
| 7 | self-regulation and in the maturation of neural connections |
| 8 | between the prefrontal cortex and the limbic system which |
| 9 | permits the better coordination of emotion and cognition. |
| 10 | These changes permit the individual to put the brakes on |
| 11 | impulse sensation-seeking behavior and to resist the |
| 12 | influence of peers, which, together, should diminish |
| 13 | risk-taking. Do you see that there? |
| 14 | A. I do. |
| 15 | Q. We see a little bit of your analogy there as well in |
| 16 | some way where you write about putting the brakes on what |
| 17 | would otherwise be an impulsive reaction, right? |
| 18 | A. Yes. |
| 19 | Q. That's what you're writing back in 2008 in this |
| 20 | paper? |
| 21 | A. Yes. |
| 22 | Q. You had testified a little bit about the |
| 23 | consequences of this as well, right, this idea that the lack |
| 24 | of impulse control due to the development of the limbic |
| 25 | system but underdevelopment of the prefrontal cortex leads |
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2 stressful situations. Do you remember giving testimony along 3 those lines? 4 Α. Yes. 5 Q. I would like to go back to the APA brief on which 6 you consulted and check that testimony against what is in the brief, so I will bring up what's been previously marked as 7 Government's Exhibit 1 for identification and I will take us 8 9 to the seventh page. 10 And the brief says there "During puberty, juveniles 11 evince a rapid increase in reward and sensation-seeking behavior that declines progressively throughout late 12 13 adolescence and young adulthood." You see that, right? 14 Α. I do. 15 0. That's consistent with what you presented to the 16 Court here today in terms of into young adulthood that 17 sensation-seeking behavior declines progressively into and 18 including that young adulthood period, right? 19 Α. Um-hum. 20 To be -- not to put too fine of a point on it, but Q. 21 through late adolescence and young adulthood, that's clearly 22 taking us through the 18 to maybe 21, 22, 23-year-old time 23 Is that fair to say? period. 24 Α. Yes, I believe I said before that the peak in this is around 17, 18, 19 or so, so after that it starts to 25

young adults or 18 to 20-year-olds to act like juveniles in

1 decline.

2 THE COURT: What's the "it" in that answer? 3 THE WITNESS: The sensation-seeking and 4 reward-seeking. 5 BY MR. PIERPONT: 6 0. I'm going to take us to the eighth page of this 7 Government's Exhibit 1 and again consistent with the brief 8 says "More recent studies confirm" -- well, let's start with 9 "In one example, researchers examined differences in 10 impulsivity between ages 10 and 30 using both self-report 11 performance measures and concluded that impulsivity declined through the relevant period with gains in impulse control 12 13 occurring throughout adolescence and into young adulthood." 14 And again consistent with your testimony on direct 15 about this idea that you are not as impulsive as your 16 prefrontal cortex begins to gain control over the limbic 17 system, right? 18 Α. Correct. 19 0. In fact, that brief also contains the following 20 language which says "Thus expecting the experience-based 21 ability to resist impulses to be fully formed prior to age 18 22 or 19 would seem on present evidence to be wishful thinking." 23 Do you see that language there? 24 Α. I do. 25 So in the brief there, you were saying impulse 0.

1 control. It would be wishful thinking to think that your 2 impulse control would be fully developed by the time that you 3 are 18 or 19; is that right? 4 Α. Yes. 5 Q. A little bit more about the impact of peers and 6 environmental pressures. The APA brief contains the 7 following language. Page 10 of what's been marked 8 Government's Exhibit 1. 9 "The ability to resist and control emotional 10 impulses to gauge risks and benefits in an adult matter and 11 to envision the future consequences of one's actions, even in 12 the face of environmental or peer pressures, are critical 13 components of social and emotional maturity necessary in 14 order to make mature, fully considered decisions. 15 Empirical research confirms that even older 16 adolescents have not fully developed these abilities and 17 hence, lack an adult's capacity for mature judgment. It is 18 clear that important progress in the development of social 19 and emotional maturity occurs sometime during late 20 adolescence and these changes have a profound effect on the 21 ability to make consistently mature decisions." 22 Do you see that language? 23 Α. I do. 24 We're focusing on the time period of late Q. 25 adolescence which would put us 18, 19, 20 in that area,

1 | right?

| 2 | A. Yes. |
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| 3 | Q. So I would like to turn now to what's been |
| 4 | previously marked as Defendant's Exhibit 2 which I have on |
| 5 | the screen here and I would like to jump into it and read a |
| 6 | little bit about the science that's contained in here. Now |
| 7 | to be clear |
| 8 | THE COURT: Is it Government's Exhibit 2? |
| 9 | MR. PIERPONT: This is Defendant's Exhibit 2. |
| 10 | THE COURT: The defendant is the Government in this |
| 11 | case. |
| 12 | MR. PIERPONT: I mean Petitioner's Exhibit 2. I |
| 13 | apologize. |
| 14 | THE COURT: Go ahead. |
| 15 | Q. To be clear, you testified on direct examination |
| 16 | that this is the present state of knowledge regarding |
| 17 | adolescence or so the best statement of knowledge |
| 18 | withdrawn. |
| 19 | Let me ask you to characterize it one more time |
| 20 | similar to as you did on direct. When you were talking about |
| 21 | the science contained in this article, how did you describe |
| 22 | it in sum and substance? |
| 23 | A. As the present state of our knowledge at the time |
| 24 | the article was written. |
| 25 | Q. You had testified as well that at least in terms of |
| | |

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1 the science contained in here, there's broad consensus about 2 the science that's in this article, right? 3 Α. Yes. 4 0. Now you are a listed author on this paper, right? 5 Α. Yes. 6 Q. As a listed author you read this paper, right? 7 Α. Yes. 8 Q. You agreed what was in it largely? 9 Α. Yes. 10 THE COURT: I'm a little confused. I'm looking at 11 what I wrote was Petitioner's Exhibit 2. Maybe that's my 12 mistake. It is an article that's written by a professor I know from NYU, Taylor-Thompson. 13 14 Α. I believe that he's speaking about Petitioner's 15 Exhibit 1. 16 THE COURT: You are not an author on 2, right? 17 MR. PIERPONT: Let me double check. 18 THE WITNESS: Mine is marked 1. 19 THE COURT: You were answering as to 1? 20 THE WITNESS: Yes. 21 THE COURT: Thank you. 22 MR. PIERPONT: That's right. I apologize this is 23 Petitioner's Exhibit 1, not Petitioner's Exhibit 2 that we're 24 speaking about. 25 THE COURT: His answer I guess was that it is a

1 present statement of the knowledge in this area. 2 At the time the article was written, yes. Α. THE COURT: Which is 2016. 3 4 BY MR. PIERPONT: Was this published in 2016 or 2017? Do you know, 5 0. 6 Professor? 7 I believe 2016, but I'm not absolutely certain. Α. So I would like to take you then to the seventh page 8 Q. of this exhibit and it reads, "Research on developmental 9 10 differences between adolescents and adults often has not 11 drawn age distinctions among individuals older than 18 and therefore is of limited value in understanding risk-taking 12 13 among young adults." Do you see that language? 14 Α. Yes. 15 Q. To be clear, young adults as we talked about in this 16 article refers to people from the ages of 18 to 21, right? 17 Α. Yes. 18 Q. This was published in 2016 you said, right? 19 Α. Yes. 20 Do you agree with this statement there's only Q. 21 limited value in understanding risk-taking among young adults 22 or that is individuals from the ages of 18 to 21? 23 Α. What we meant by this sentence is that -- is that 24 there has not been a lot of research that has specifically 25 looked at people who are older than 18 and divided them up

| 1 | into different age groups for purposes of comparison. |
|------|---|
| 2 | Q. To be clear, the conclusion that you draw from that |
| 3 | is that research on developmental differences is, therefore, |
| 4 | of limited value in understanding risk-taking amongst young |
| 5 | adults, right? |
| 6 | A. Yes, but the next word is "nevertheless." |
| 7 | THE COURT: Could I ask you to give me the page of |
| 8 | the article, not the seventh page because I went to the |
| 9 | seventh piece of paper and I can't find the language. |
| - 10 | MR. PIERPONT: I understand. Page 646, Your Honor. |
| 11 | THE COURT: Thank you. Okay. I got it. |
| 12 | BY MR. PIERPONT: |
| 13 | Q. You continue "Nevertheless, theoretical models can |
| 14 | inform our discussion of risk-taking in young adulthood," |
| 15 | right? |
| 16 | A. Yes. I do think it is fair to look at both of those |
| 17 | sentences together. |
| 18 | Q. So later on page 647 and going into 648, you write, |
| 19 | as one of the three authors, "The age patterns in risk-taking |
| 20 | would seem to offer support for the conclusion that young |
| 21 | adults are also affected by the developmental influence |
| 22 | that" hang on one second. I will withdraw that. |
| 23 | Let's start right here at the beginning of 648. You |
| 24 | write, "The study of psychological development in young |
| 25 | adulthood is less advanced and the findings of this research |
| | |

1 are less consistent than the findings of research on 2 adolescents. Do you see that language there? 3 Α. I do. 4 Q. Do you agree with that statement? 5 Α. Yes. 6 Q. And you go on to give a couple of limitations and I 7 will focus on two of them now today discussing some of the 8 shortcomings with the research on young adults in this paper 9 here. 10 The first one reads "One limitation" and I will zoom 11 in so everyone can read. 12 "One limitation is that studies rarely survey a 13 sample that includes adolescents, young adults and 14 individuals in their late 20s using the same measure for all 15 three groups." Do you see that language there? 16 Α. I do. 17 Q. You agree that's a shortcoming with the research 18 amongst 18 or 21-years-old? 19 Α. Yes. 20 Q. You continue to write or you and two other authors 21 continue to write, "A second limitation is that studies that 22 span the necessary age range frequently lack the statistical 23 power to compare narrowly defined age groups." Do see that 24 language as well? 25 Α. Yes.

1 Q. You would agree with that statement as well? 2 Α. Yes, I do. 3 Studies of 18 to 21-year-olds don't always have the Q. 4 statistical oomph that's needed to maybe pass muster at least 5 in the same way as first studies amongst adolescents. Is that 6 fair to say? 7 Α. I think what we meant there was that studies that have adults or people from 18, all the way up to further into 8 9 the 20s, don't necessarily divide them up into age groups where there's enough statistical power to compare them. 10 It 11 is not within the 18 to 21 group as you phrased your 12 question, but it is wider than that. 13 0. I understand. So let's take a look then at page 649 14 of this exhibit. You write "Conclusions about whether 15 psychological development continues beyond age 18 are highly 16 task dependent. Consider, for example, the question of 17 whether young adults." Again in that context, taking about 18 18 to 21-year-olds, right? 19 Α. Yes. 20 0. "Like juveniles, are more susceptible than older 21 adults to peer influence. The answer is equivocal." Do you 22 see that writing there? 23 Α. I do. 24 Do you agree with that statement that the science Q. 25 and the studies suggest -- well, it is ambiguous as to what

1 impact peer pressure has on young adults? 2 Α. That's right. 3 0. You continue to write there "Studies of resistance to peer influence using self-reports do not find age 4 differences after 18." Do you see that language there? 5 6 Α. I do. 7 Q. "But experimental studies comparing individuals' performance on decision-making tasks, when they are alone 8 9 versus when they are with their peers find peer effects on task" --10 11 THE COURT: Could I just ask you to slow down. My 12 brain can't compute what you are saying so I have no idea how 13 she can take it down. My brain can't listen at the speed. 14 MR. PIERPONT: Happy to slow down. 15 THE COURT: Thank you. 16 BY MR. PIERPONT: 17 Q. So you continue to write "Studies of resistance to peer influence using self-reports do not find age differences 18 19 after 18, but experimental studies comparing individuals 20 performance on decision-making tasks when they were alone 21 versus when they are with their peers find peer effects on 22 task performance after this age at least into the early 20's" 23 Do you see that language there? 24 I do. Α. 25 Q. You continue to agree with that language?

A. Yes.

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2 "For example, exposure to peers increases young 0. adults' preference for immediate rewards, willingness to 3 4 engage in exploratory behavior and ability to learn from 5 experience." 6 Do you see that. 7 Α. Yes. 8 0. You continue to write "In some studies, exposure to 9 peers has been shown to increase young adults' risk-taking; but in other studies, this has not been found." 10 11 Do you see that as well, right. 12 Α. Yes. 13 Q. So jumping to page 651 of this exhibit. Here you 14 are discussing neurobiological research and brain development 15 in young adulthood. And you write, along with other authors, "As with behavioral research, very few studies have 16 17 systematically examined age differences in brain development 18 among individuals older than 18. In most studies, 19 adolescents are compared to adults with the latter group 20 composed of people who may be as young as 19 or as old 50. 21 When adult comparison groups average data from such a wide 22 age range, it is impossible to draw specific inferences about 23 potential differences between young adults and their older 24 counterparts." 25 Do you see that language there?

A. Yes.

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Q. Do you agree that where adult comparison groups have average data from such wide age ranges, that it is impossible to draw specific inferences about individuals from the age of 18 to 21?

A. If you don't have that category separated out, you7 couldn't.

Q. You agree with this that in most studies that is the
case, that adolescents are compared to adults with people
from the ages of 18 to 50 in that group, right?

A. Yes.

12 Q. On the next page, this is on page 652. You write as 13 follows about this research on brain systems and that is, "The research indicates that brain systems governing thinking 14 15 about social relationships undergo significant change in 16 adolescence in ways that heighten concerns about the opinions 17 of others. Compared to adults, adolescents seem especially sensitive to both praise and rejection, making young people 18 19 potentially more easily influenced by their peers."

20

11

You continue to write.

"But very little research has asked whether and how these brain systems continue to change beyond the teen years. One study that examined the impact of peers on neural responses to reward in a sample of adolescents, ages 14 to 18, young adults, 19 to 22, and adults, 24 to 29, found that

the presence of peers increased activation in this brain 1 2 region among adolescents but had no impact in the other two 3 age groups." 4 You see that language there, right? 5 Α. I do. 6 The other two age groups in this case would include Q. 7 young adults albeit as defined from 19 to 22, right? 8 Α. Yes. 9 Q. I will take us to one more page here and I will read 10 two separate highlighted parts. And this, Your Honor, is on 11 page 653 of Petitioner's Exhibit 1. 12 You write "It is clear that the psychological and 13 neurobiological development that characterizes adolescence 14 continues into the midtwenties, but the research has not yet 15 produced a robust understanding of maturation in young adults 16 age 18 to 21. 17 You see that, right? 18 I do. Α. 19 And you agree that there is not yet a robust Q. 20 understanding of maturation in young adults aged 18 to 21? 21 Α. I do. 22 Q. You continue later, "The research on age patterns in 23 risk-taking and on emotional maturation, particularly on 24 impulse control in negative arousal states and peer influence 25 in social contexts, provide the most powerful evidence that

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| 1 | young adult offending likely represents a continuation of |
| 2 | adult (sic) risk-taking, driven by developmental forces; but |
| 3 | many uncertainties remain." |
| 4 | Do you see that language as well? |
| 5 | A. I am but in your reading of it I think you misquoted |
| 6 | it. It likely represents a continuation of adolescent |
| 7 | risk-taking. I believe you said adult risk-taking. It says |
| 8 | adolescent risk-taking in the article. |
| 9 | Q. Yes. Adolescent risk-taking, but you do agree that |
| 10 | uncertainties remain in that regard? |
| 11 | A. I'm sorry. |
| 12 | Q. You do agree that uncertainties remain in that |
| 13 | regard, right? |
| 14 | A. Yes. |
| 15 | MR. PIERPONT: Excuse me for one moment. |
| 16 | I have nothing further, Your Honor. Thank you. |
| 17 | THE COURT: I have a few questions. I will ask them |
| 18 | before redirect. I will give the Government a chance to |
| 19 | follow-up if they have questions on my questions. Give me a |
| 20 | minute to organize my thoughts. |
| 21 | Well, let's start with some kind of visual basics. |
| 22 | In my mind, when you told me to think about risk-taking, you |
| 23 | told me to think of an upside down U where the horizontal |
| 24 · | axis would be age, the risk-taking would go vertically and I |
| 25 | will see it go up and then down. Is that fair? |
| | |

1 THE WITNESS: Yes. 2 THE COURT: So there's in effect a trough in the U 3 even though it is upside down. If I righted the U, there 4 would be a trough at the bottom so in this case, it is at the 5 top? 6 THE WITNESS: Yes. 7 THE COURT: Did I understand your testimony to be 8 that the peak of that upside down U is 17, 18 and 19? 9 THE WITNESS: Yes. Although, Your Honor, I believe 10 I said, if I didn't, I will now. A lot of it depends on the 11 specific type of risk-taking that you are talking about and 12 the specific measure that's being used but generally 13 speaking, that's where the peak is. THE COURT: Okay. Then you also said, and I might 14 15 have got this wrong, but I believe you also said that impulse 16 control was fully developed by 18 to 19, did I take that down 17 incorrectly? 18 THE WITNESS: No, I didn't say that. 19 THE COURT: That's when he was going fast. I was 20 trying to catch up. 21 THE WITNESS: What I believe I said was that impulse 22 control continues to develop into the midtwenties. 23 THE COURT: Okay. So that diagram is an axis of age 24 horizontal, vertical is impulse control. It is a straight 25 line up until about the midtwenties?

THE WITNESS: Then it plateaus, exactly. 1 THE COURT: Thank you. That's that. When an expert 2 3 testifies in court, Professor, they are required to be able to at least state to a reasonable degree of, in your case, 4 psychological study certainty that something is more likely 5 6 true than not true? 7 THE WITNESS: Yes. 8 THE COURT: So I don't know if this is proper. Anybody wants to object, please object. I will not be 9 offended, but I would like to ask you some questions that are 10 going to be sort of focused on confidence levels. 11 12 In other words, I assume nothing you've said today 13 do you question is at least more likely true than not in 14 terms of your opinions that you gave about impulse control, 15 risk-taking, age changing, et cetera. But I'm interested in 16 confidence sort of levels. In other words, how much above 50 17 percent are you certain or believe to be is the case true. 18 In other words, I will start with -- I will start 19 with something. It sounds like you define late adult 20 adolescence as 18, 19, 20 and adulthood or young adulthood at 21 over 20? 22 THE WITNESS: Yes. 23 THE COURT: And what is the confidence level you 24 have that is where the line should be drawn in a 25 psychological sense?

THE WITNESS: Um.

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2 When you say line in that context? MR. PIERPONT: 3 THE COURT: His categorizations. I'm calling them lines. But I can change line to categories, but the line --4 5 20 falls into one category, 21 falls into another category in 6 my mind, that's a line between 20 and 21. I'm asking -- this 7 is kind of a really pure psychology question. It could be related to the case. In terms of these categories that seem 8 9 to be drawn early, mid, late adolescence, young adulthood, 10 you know. 11 I guess I could get up on the stand and say well, 12 early adolescence, in my opinion, starts at six. You would 13 laugh because you know as a psychologist, that's not a fair 14 characterization of the category known as early adolescence. 15 So I'm trying to get at the witness's view of his 16 confidence that 20 is indeed the proper end of late 17 adolescence. 18 Why wouldn't it be 21? I guess I can put it that 19 way. 20 It could be, Your Honor. These are THE WITNESS: 21 labels. These are shorthands that we use for purposes of 22 communication. A lot of development, in fact, most of 23 development is gradual and where we choose to draw lines for 24 purposes of creating these labels or for purposes of the law, 25 it is not arbitrary but reasonable people might disagree as

1 to whether it should be 21 or 22. 2 If I may, to the extent that a different way to 3 answer the question is, Am I confident that development is 4 still going on? Yes. Absolutely confident. 5 THE COURT: Based upon your education, training, 6 your research involvement, is it your opinion that 7 20-year-olds, generally speaking, obviously we're all made up 8 of humans who are entirely different, but as a class, someone 9 age 20 is more like an 18 or 19-year-old or more like a 10 21-year-old in categorization of psychologically? That 11 didn't make any sense. 12 THE WITNESS: No. It made perfect sense. 13 MR. PIERPONT: Your Honor, I'm again when you say 14 psychological. In what sense? 15 THE COURT: The characteristics we have been talking 16 about. Development of the frontal lobe, risk-taking, impulse 17 control. I guess I would hope he wouldn't put a 65-year-old 18 in the same category as an 18-year-old in describing them 19 psychologically as far as development and all of these other 20 aspects that he's spoken about in describing 13-year-olds 21 versus 15-years-old versus 18-years-old. 22 I'm trying to have a sense of -- and I understand 23 the last answer is a perfectly sound one at least to my 24 ignorant hearing -- I'm ignorant I mean -- of the idea that 25 reasonable people can differ. Reasonable researchers might

1 create a different class to study. They might look at 19 to 2 23-year-olds, but in his view that he categorized these folks 3 there, I'm trying to understand, I assume it is based on his 4 view, his belief, his judgment as an expert that those years 5 share common characteristics while they may be developing and 6 evolving over time, but they still belong together in a 7 psychological sense. I guess that's what I'm trying to say. THE WITNESS: Yes. If I can elaborate a bit. 8 9 THE COURT: Please do. 10 THE WITNESS: It is not just an opinion in the study 11 that I mentioned before of the 5,000 people from eleven different countries, we actually statistically said well, 12 13 when does self-control hit a plateau. We quantitatively 14 asked when that was. It was at 22 was the earliest we could see it, so in the sense that people who are still developing 15 share that as a similarity, then people who are 20 are more 16 17 like people who are younger because they are also still 18 developing. 19 THE COURT: So to me that implies that there are 20 greater cross category differences than within category 21 differences? 22 THE WITNESS: Yes. THE COURT: So in your opinion, an 18-year-old -- Is 23 24 an 18-year-old more similar to a 20-year-old or to a 25 17-year-old? Again we're speaking in general broad

statistical census. I'm not talking about be an individual 1 2 person. 3 THE WITNESS: It depends on what your -- to me I 4 think of them as comparable. That is I wouldn't say one or 5 the other. I think it would depend on the measure of 6 similarity that you were going to use. 7 THE COURT: Well, certainly an 18-year-old is closer 8 to a 17-year-old than a 20-year-old in numerical sense. 9 THE WITNESS: Yes. I think if you looked at 10 measures of things like self-control, you would find closer 11 scores between 18-year-olds and 17-year-olds because they are closer together on that horizontal axis than you would 12 13 between 18-year-olds and 20-year-olds because the development 14 of those things is linear and gradual, so the further apart 15 on the axis you are, then the further apart you will be on 16 their scores. 17 THE COURT: That's on the impulse control chart? 18 THE WITNESS: Yes. 19 THE COURT: On the risk one, we have already 20 established that it is an upside down curve so 18 and 20 21 might be roughly the same place or roughly equal to 19? 22 THE WITNESS: Pretty close, yeah. 23 THE COURT: There were a number of places that 24 Government's counsel pointed you to in Petitioner's Exhibit 25 1, the article that you co-authored, and I will not go back

1 over the exact language, but I just happen to write down I 2 think at page 649, the phrase, After 18 years is used and 3 651, quote, older than 18. When you wrote those words or co-wrote those words, was that literally accurate? In other 4 5 words, you were writing and expressing a view with respect to 6 people who are 19 and 20 or does over 18 or older than 18 in 7 those contexts mean 18 years and one day? If you need to go 8 back to the article.

9 THE WITNESS: No. I know what you are referring to, 10 Your Honor, yes. My answer to that has to put the article in 11 context. As I mentioned before, the first and second authors 12 are law professors and this article was written specifically 13 because we were asked for a conference held at Fordham to 14 look at the current legal boundary in the United States for 15 purposes of criminal prosecution.

THE COURT: Is under 18?

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17 THE WITNESS: Exactly. To say basically is 18 the 18 place where we should be drawing this line. Had we been 19 asked to address a different question. That is the question 20 before the court today, should the line be drawn at 21 or at 21 whatever age, we would have written the sentence that way. 22 So in other words, the construction of the sentence came out 23 of the legal question of this article. 24 THE COURT: Miller is under 18?

THE WITNESS: Exactly.
THE COURT: That's helpful. Thank you. I think 1 that's all that I had. The only thing I would ask before we 2 3 go to redirect or the Government's cross on that is I don't 4 usually let a CV be marked into evidence, but I was thinking 5 although I took some notes about the brief questions you 6 asked him, if you had a CV for the professor, would there be 7 objection to marking it? I think it might be helpful to have 8 it in the record. 9 MR. PIERPONT: No objection. 10 MR. KOCH: I have one. THE COURT: That will be Petitioner's Exhibit 3. 11 Ι 12 think probably I should let the Government cross on my 13 questions and then the redirect would cover both the 14 Government's cross and my questions. Is that all right? 15 MR. PIERPONT: Your Honor, the Government is not 16 going to have cross-examination on those questions. 17 THE COURT: You are welcome to. 18 MR. PIERPONT: I appreciate that. Thank you. 19 THE COURT: Attorney Koch. 20 MR. KOCH: Thank you, Your Honor. On the CV, I 21 can --22 THE COURT: If you don't have a copy, I would as you 23 show it to the Government unless they have seen it. Send it 24 to Diahann and we'll mark it. The hearing is going to go 25 past today. It is not a harm.

1 MR. KOCH: They have seen it. They got it from me. 2 Now they are giving me my copy. 3 THE COURT: So that will be Petitioner's 3. Give it to Diahann. She'll mark it later. Thank you. I don't need 4 5 to see it right now, Diahann. I think it should be in the 6 record. Go ahead, Attorney Koch please. 7 MR. KOCH: Thank you, Your Honor. 8 REDIRECT EXAMINATION 9 BY MR. KOCH: 10 All right. Professor Steinberg, stepping back a 0. minute or two. I guess relating to the last questions of Her 11 12 Honor. Are psychologists as interested in drawing these 13 categorical lines as lawyers are? 14 Α. No. 15 Q. What's your main interest driving all of this 16 research? 17 Α. My main interest is to better understand how 18 decision-making abilities change between the ages of 10 and 19 30. 20 Q. So you were to take your research outside of any 21 context of line drawing or legal or policy considerations, 22 where would you just float the age of full maturity of the 23 brain? 24 As I said before, around age 22 or 23, based on Α. 25 current information.

1 0. The Government pointed to different kinds of 2 reservations and qualifications in the article that you 3 Do those reservations and qualifications undermine wrote. 4 your confidence in your conclusions here today? 5 Α. Well, as I responded when the Government was asking 6 its questions, I still stand by what we wrote which is that 7 we know less about young adults, late adolescents, if you 8 will, than we do about people who are under 18. That's a 9 statement of fact because as I explained when you were 10 questioning me, that has been a much later focus of research so not as large a body of evidence has accumulated. 11 12 So as a scientist, the more studies there of 13 something and the more consistent the findings are, the more 14 confident we are. 15 The reason that Scott and Bonnie and I wrote this 16 paper that we were just talking about is because people were 17 raising legal questions about where we ought to draw the 18 line. We looked at the science and said, you know, there's 19 enough here to open up the discussion. It is not -- it is 20 not as fully developed as the literature is on adolescence, 21 but there's enough studies in my view and my co-authors' view 22 to say I think we should revisit this. 23 0. Does your research ever conclude that any bright 24 line should be drawn? 25 No. And as a scientist -- that's a legal question. Α.

1 That's not for me to answer. What I see my role today and in 2 other cases in which I have testified, is to do my best job 3 of explaining the science to the legal decision-makers. It 4 is their decision to decide how to use that science to draw 5 legal boundaries. That's not a scientific question.

Q. Does any of your research support that there's a
clear clinical psychological difference between your average
17-year-old and your average 18-year-old?

9 Α. I would say probably not. If you were asking me as 10 a scientist, if I thought that we would find a statistically 11 significant difference between 17-year-olds and 18-year-olds 12 on the kind of things that we study or to use Her Honor's way 13 of putting it which was correct that we would find greater 14 between category differences than within category 15 differences, no, I can't think of a study where one would 16 find such a bright-line boundary.

Q. At some point, you were asked about something that the Government had pointed to about similarities that exist between -- strike that question.

Let me ask you it differently. 18, 19, and 21 20-year-olds, you have testified they have some similarities 22 with adults, right?

23 A. Sure.

24 Q. How does hot cognition play into that?

25 A. I would say that the similarities that you would

1 find are more in the realm of cold cognition. In hot 2 cognition is where you would find the differences between 3 people that age and adults. 4 Q. Would it be fair to say under hot cognition, that's 5 where late adolescence are more similar to mid adolescence 6 than they are to adults? 7 Α. Absolutely. That's exactly how I would put it. 8 MR. KOCH: Nothing further. Thank you. 9 THE COURT: Just based on something that you said a 10 moment ago or it was imbedded in a very long answer of 11 something you said a moment ago, I want to have the record be 12 clear. Is it your opinion to a reasonable degree of 13 psychological science certainty that the findings which 14 underpinned your conclusions as to the petitioner's in, for 15 example, Graham, under 18, actually they were 14 but the 16 opinion says under 18, you have the same opinion as to 18? 17 THE WITNESS: Yes. And had that been the question 18 that was asked in Graham, I would have said the same things. 19 I would have changed the age in the brief. 20 THE COURT: The number would have changed? 21 THE WITNESS: Exactly. 22 THE COURT: If someone said could you change it to 23 21, would you have been able to do that based upon your 24 expertise as a psychologist? 25 THE WITNESS: I don't think I would be confident

1 enough. I think I would be confident enough about 20, but 2 not 21, but we're really, you know, in terms of reasonable 3 scientific certainty, I am more certain about 20 than I am about 21. 4 5 THE COURT: As to 18? 6 THE WITNESS: Absolutely certain. 7 THE COURT: All right. I don't have if you have 8 questions on that. 9 MR. KOCH: I have one follow-up question. When you 10 said 20, up to 20 or through 20? 11 THE COURT: I was asking and if you didn't 12 understand me, when I was using 18, 20, 22, I was referring 13 to a person who nominally has that age. In other words, not 14 under, but is at the moment a 20-year-old, i.e, a person who 15 could be 20 years and a day or 20 years and 11 months and 29 16 days. 17 THE WITNESS: That's how I understood your 18 question. 19 MR. KOCH: Thank you, Professor. 20 THE COURT: Professor, I think we'll get you back to 21 Philadelphia. I apologize for the delay this morning. 22 THE WITNESS: It happens. 23 THE COURT: It shouldn't. I'm thinking of sending 24 some other agency of the government your bill, but we'll deal 25 with that later. Thank you very much.

The other thing I wanted to put on the record and I apologize I kind of assumed things and I shouldn't assume things. You mentioned the presence of the family members of the victim Mr. White. I assume they are here because you fulfilled your obligation under the Victim's Right act by notifying them. There was a second victim whose name I believe was Diaz. Any family?

8 MS. COLLINS: We have made efforts and the agents 9 have been helping us make efforts. We have not be able to 10 locate a member of the Diaz family. The White family was 11 helping us with that as well. We're not able to reach the 12 person. We're continuing that. We're hoping to do that 13 before the 29.

14 THE COURT: In the category of not assuming 15 anything, I understood your remarks. I don't want to assume 16 it, Attorney Pierpont. While the members are present of the 17 White family which I appreciate that no one wished to 18 participate I guess in this proceeding, the hearing. I don't 19 know that they could. They have right to be present and to 20 be heard I think, but I don't know heard at an evidentiary 21 hearing, I'm not sure.

MR. PIERPONT: I think the read here that we have we informed them, we talked to them about this hearing and what was going to happen at the hearing. I don't believe it would be the Government's position that in this context, they would

12 1 2

1 have the right to be heard. If that comes up, we'll continue 2 to apprise them of those rights. THE COURT: Okay. They have a right to be heard at 3 4 any public proceeding involving release, plea, sentencing, 5 parole. This is in the nature of evidentiary hearing. They 6 have a right to be informed of all proceedings. I think you 7 were right to do that. 8 Attorney Koch, I believe you indicated on your 9 witness list that you intended to call Mr. Cruz to testify. 10 MR. KOCH: Yes, Your Honor. 11 THE COURT: Can we do that now? 12 I had an agreement with the Government MR. KOCH: 13 that we would do that on another day which is why I believe 14 we scheduled September 29. 15 THE COURT: I did, but I did it based on the 16 representation that the professor would take all day. 17 Therefore, we would need more time. I set aside the whole 18 day. Somebody else is responsible for ruining my morning. But I don't know. Why did you ask me to set aside a whole 19 20 day? I don't mind doing it in two days. Why did I schedule 21 a whole day? 22 MR. KOCH: Could I have a moment with the Government 23 please? 24 THE COURT: Sure. 25 MR. KOCH: Thank you.

1 I know that Your Honor would like to go forward. I 2 thought that there was an off-chance that this might be the 3 case. However, Mr. Cruz I didn't get to seem him before we were in court today, and I was kind of relying on the 4 September 29 date and I apologize that we have taken --5 6 THE COURT: My concern if I weren't looking out at a 7 room full of the public who will have to return I assume 8 given their level of interest. I can go back and do work on something else right now. But, you know, would I rather have 9 10 the 29 open and not occupied with this, yes. Would I rather 11 not inconvenience people, yes. 12 MS. COLLINS: Prior to today -- may I? Prior to 13 today's proceedings in informing the family, we gave them the 14 date of 29 once the Court issued that date on the calendar. 15 They are well aware that's going to occur on the 29th. They 16 have been told that ahead of today and I think that --17 THE COURT: You have no objection to it continuing? 18 MS. COLLINS: We have to objection to the 29. 19 THE COURT: You are a lucky man, Attorney Koch. 20 That's all I can say. 21 MR. KOCH: Thank you, Your Honor. 22 THE COURT: Please understand the next time I 23 schedule an all-day hearing, when one finishes in five 24 minutes, I don't expect to recess to take the second witness

25 on the second day. I intend to go to the second witness.

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| 1 | That's at trials, hearings, anything in front of Judge Hall. |
|----|--|
| 2 | Write it down in your book. Is there anything else? We'll |
| 3 | stand adjourned. |
| 4 | (Whereupon, the above hearing adjourned at 3:18 |
| 5 | p.m.) |
| 6 | |
| 7 | |
| 8 | |
| 9 | |
| 10 | COURT REPORTER'S TRANSCRIPT CERTIFICATE |
| 11 | I hereby certify that the within and foregoing is a true and |
| 12 | correct transcript taken from the proceedings in the |
| 13 | above-entitled matter. |
| 14 | |
| 15 | <u>/s/ Terri Fidanza</u> |
| 16 | Terri Fidanza, RPR |
| 17 | Official Court Reporter |
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Appendix B

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Commonwealth v. Bredhold, Case No. 14-CR-161 (2017) (unpublished opinion from a Kentucky Trial Court)

COMMONWEALTH OF KENTUCKY FAYETTE CIRCUIT COURT SEVENTH DIVISION CASE NO. 14-CR-161

COMMONWEALTH OF KENTUCKY

PLAINTIFF

ENTERED ATTEST, VINCENT RIGGS, CLERK

AUG 0 1 2017

FAYETT

CLERK

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TRAVIS BREDHOLD

DEFENDANT

ORDER DECLARING KENTUCKY'S DEATH PENALTY STATUTE AS UNCONSTITUTIONAL

This matter comes before the Court on Defendant Travis Bredhold's Motion to declare the Kentucky death penalty statute unconstitutional insofar as it permits capital punishment for those under twenty-one (21) years of age at the time of their offense. Mr. Bredhold argues that the death penalty would be cruel and unusual punishment, in violation of the Eighth Amendment, for an offender under twenty-one (21) at the time of the offense. The defense claims that recent scientific research shows that individuals under twenty-one (21) are psychologically immature in the same way that individuals under the age of eighteen (18) were deemed immature, and therefore ineligible for the death penalty, in *Roper v. Simmons*, 543 U.S. 551 (2005). The Commonwealth in turn argues that Kentucky's death penalty statute is constitutional and that there is no national constensus with respect to offenders under twenty-one (21). Having the benefit of memoranda of law, expert testimony, and the arguments of counsel, and being otherwise sufficiently advised, the Court sustains the Defendant's motion.

FINDINGS OF FACT

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Travis Bredhold was indicted on the charges of Murder, First Degree Robbery, Theft by Unlawful Taking \$10,000 or More, and three Class A Misdemeanors for events which occurred on December 9, 2013, when Mr. Bredhold was eighteen (18) years and five (5) months old.

On July 17, 2017, the Court heard testimony from Dr. Laurence Steinberg in the case of Commonwealth v. Diaz, et al., No. 15-CR-584.¹ Dr. Steinberg, an expert in adolescent development, testified to the maturational differences between adolescents (individuals ten (10) to twenty-one (21) years of age) and adults (twenty one (21) and over). The most significant of these differences being that adolescents are more impulsive, more likely to misperceive risk, less able to regulate behavior, more easily emotionally aroused, and, importantly, more capable of change. Additionally, Dr. Steinberg explained how these differences are exacerbated in the presence of peers and under emotionally stressful situations, whereas there is no such effect with adults. Dr. Steinberg related these differences to an individual's culpability and capacity for rehabilitation and concluded that, "if a different version of *Roper*-were-heard-today, knowing what we know now, one could've made the very same arguments about eighteen (18), nineteen (19), and twenty (20) year olds that were made about sixteen (16) and seventeen (17) year olds in *Roper*."² Dr. Steinberg supplemented his testimony with a report further detailing the structural and functional changes responsible for these differences between adolescents and adults, as will be discussed later in this opinion.³

¹ See Order Supplementing the Record. Com. v. Diaz is also a Seventh Division case. The Commonwealth was represented by Commonwealth Attorney Lou Anna Red Com, and her assistants in both cases, 14-CR-161 & 15-CR-584. Dr. Steinberg was aptly cross-examined by the Commonwealth Attorney.

¹ Hearing July 17, 2017 at 9:02:31.

³ Defendant's Supplement to Testimony of Laurence Steinberg, July 19, 2017.

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On May 25th and 26th, 2016, an individual assessment of Mr. Bredhold was conducted by Dr. Kenneth Benedict, a clinical psychologist and neuropsychologist. A final report was provided to the Defendant's counsel and the Commonwealth and has been filed under seal. After reviewing the record, administering multiple tests, and conducting interviews with Mr. Bredhold, members of his family, and former teachers, Dr. Benedict found that Mr. Bredhold was about four years behind his peer group in multiple capacities. These include: the development of a consistent identity or "sense of self," the capacity to regulate his emotions and behaviors, the ability to respond efficiently to natural environmental consequences in order to adjust and guide his behavior, and his capacity to develop mutually gratifying social relationships.⁴ Additionally, he found that Mr. Bredhold had weaknesses in executive functions, such as attention, impulse control, and mental flexibility.⁵ Based on his findings, Dr. Benedict diagnosed Mr. Bredhold with a number of mental disorders, not the least being Attention Deficit Hyperactivity Disorder (ADHD), learning disabilities in reading and writing, and Post Traumatic Stress Disorder (PTSD).⁶

- CONCLUSIONS OF LAW -

The Eighth Amendment to the United States Constitution states, "[e]xcessive bail shall not be required, nor excessive fines imposed, nor cruel and unusual punishments inflicted." U.S.C.A. Const. Amend. VIII. This provision is applicable to the states through the Fourteenth Amendment. The protection flows from the basic "precept of justice that punishment for crime should be graduated and proportioned to [the] offense." *Atkins v. Virginia*, 536 U.S. 304, 311 (2002) (quoting *Weems v. United States*, 217 U.S. 349, 367 (1910)). Eighth Amendment jurisprudence has seen the consistent reference to "the evolving standards of decency that mark the progress of a maturing

⁴ Id at 6.

⁵ Id at 3.

⁶ Id at 5.

society" to determine which punishments are so disproportionate as to be "cruel and unusual." Trop v. Dulles, 356 U.S. 86, 100-101 (1958). The two prongs of the "evolving standards of decency" test are: (1) objective indicia of national consensus, and (2) the Court's own determination in the exercise of independent judgment. Stanford v. Kentucky, 492 U.S. 361 (1989); Atkins, 536 U.S. 304; Roper v. Simmons, 543 U.S. 551 (2005).

I. Objective Indicia of National Consensus Against Execution of Offenders Younger than 21

Since *Roper*, six (6) states⁷ have abolished the death penalty, making a total of nineteen (19) states and the District of Columbia without a death penalty statute. Additionally, the governors of four (4) states⁸ have imposed moratoria on executions in the last five (5) years. Of the states that do have a death penalty statute and no governor-imposed moratoria, seven⁹ (7) have *de facto* prohibitions on the execution of offenders under twenty-one (21) years of age, including Kentucky. Taken together, there are currently thirty states in which a defendant who was under the age of twenty-one (21) at the time of their offense would not be executed – ten (10) of which have made

their prohibition on the death penalty official since the decision in Roper in 2005.

Of the thirty-one (31) states with a death penalty statute, only nine (9) executed defendants who were under the age of twenty-one (21) at the time of their offense between 2011 and 2016.¹⁰

⁸ The governors of Pennsylvania and Washington imposed moratoria on the death penalty in 2015 and 2014, respectively. The governor of Oregon extended a previously imposed moratorium in 2015. The governor of Colorado granted an indefinite stay of execution to a death row inmate in 2013.

⁷ The states that have abolished the death penalty since *Roper* and year of abolition: Connecticut (2012), Illinois (2011), Maryland (2013), New Jersey (2007), New Mexico (2009), and New York (2007).

⁹ Kansas and New Hampshire have not executed anyone since 1977. Montana and Wyoming have never executed anyone who was under twenty-one (21) years of age at the time of their offenses, and they currently have no such offenders on death row. Utah has not executed anyone who was under twenty-one (21) years of age at the time of their offense in the last fifteen (15) years, and no such offender is currently on Utah's death row. Idaho and Kentucky have not executed anyone who was under twenty-one (21) years old at the time of their offense in the last fifteen (15) years.

¹⁰ Chart of Number of People Executed Who Were Aged 18, 19, or 20 at Offense from 2000 to Present, By State [current as of February 29, 2016]

Those nine (9) states have executed a total of thirty-three (33) defendants under the age of twentyone (21) since 2011 – nineteen (19) of which have been in Texas alone.¹¹ Considering Texas an outlier, there have only been fourteen (14) executions of defendants under the age of twenty-one (21) between 2011 and 2016, compared to twenty-nine (29) executions in the years 2006 to 2011, and twenty-seven (27) executions in the years 2001 to 2006 (again, excluding Texas).¹² In short, the number of executions of defendants under twenty-one (21) in the last five (5) years has been cut in half from the two (2) previous five- (5) year periods.

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Looking at the death penalty as practically applied to all defendants, since 1999 there has been a distinct downward trend in death sentences and executions. In 1999, 279 offenders nationwide were sentenced to death, compared to just thirty (30) in 2016 – just about eleven (11) percent of the number sentenced in 1999.¹³ Similarly, the number of defendants actually executed spiked in 1999 at ninety-eight (98), and then gradually decreased to just twenty (20) in 2016 – only two of which were between the ages of eighteen (18) and twenty (20).

Contrary to the Commonwealth's assertion, it appears there is a very clear national consensus trending toward restricting the death penalty, especially in the case where defendants are eighteen (18) to twenty-one (21) years of age. Not only have six more states abolished the death penalty since *Roper* in 2005, four more have imposed moratoria on executions, and seven more have *de facto* prohibitions on the execution of defendants eighteen (18) to twenty-one (21). In addition to the recent legislative opposition to the death penalty, since 1999 courts have also shown a reluctance to impose death sentences on offenders, especially those eighteen (18) to

¹¹ Id.

¹² Id.

¹³ Death Penalty Information Center, Facts About the Death Penalty (Updated May 12, 2017), downloaded from https://deathpenaltyinfo.org/documents/FactSheet.pdf.

twenty-one (21. "[T]he objective indicia of consensus in this case – the rejection of the juvenile death penalty in the majority of States; the infrequency of its use even where it remains on the books; and the consistency in the trend toward abolition of the practice – provide sufficient evidence that today our society views juveniles ... as 'categorically less culpable than the average criminal." *Roper*, 543 U.S. at 567 (quoting *Atkins*, 536 U.S. at 316). Given this consistent direction of change, this Court thinks it clear that the national consensus is growing more and more opposed to the death penalty, as applied to defendants eighteen (18) to twenty-one (21).

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2. The Death Penalty is a Disproportionate Punishment for Offenders Younger than 21

As the Supreme Court in *Roper* heavily relied on scientific studies to come to its conclusion, so will this Court. On July 17, 2017, in the case of Commonwealth of Kentucky v. Diaz, this Court heard expert testimony on this topic. Dr. Laurence Steinberg testified and was also allowed to supplement his testimony with a written report. The report cited multiple recent studies supporting the conclusion that individuals under twenty-one (21) years of age are categorically less culpable in the same-ways that the Court-in-*Roper*-decided individuals under the conclusion that the death penalty should be excluded for defendants who were under the age of twenty-one (21) at the time of their offense.

If the science in 2005 mandated the ruling in Roper, the science in 2017 mandates this ruling.

\ Through the use of functional Magnetic Resonance Imaging (fMRI), scientists of the late 1990s and early 2000s discovered that key brain systems and structures, especially those involved in self-regulation and higher-order cognition, continue to mature through an individual's late

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teens.¹⁴ Further study of brain development conducted in the past ten (10) years has shown that these key brain systems and structures actually continue to mature well into the mid-twenties (20s); this notion is now widely accepted among neuroscientists.¹⁵/

- Recent psychological research indicates that individuals in their late teens and early twenties (20s) are less mature than their older counterparts in several important ways.¹⁶ First, these individuals are more likely than adults to underestimate the number, seriousness, and likelihood of risks involved in a given situation.¹⁷ Second, they are more likely to engage in "sensationseeking," the pursuit of arousing, rewarding, exciting, or novel experiences. This tendency is especially pronounced among individuals between the ages of eighteen (18) and twenty-one (21).¹⁸ Third, individuals in their late teens and early twenties (20s) are less able than older individuals to control their impulses and consider the future consequences of their actions and decisions because gains in impulse control continue to occur during the early twenties (20s).¹⁹ Fourth, basic cognitive abilities, such as memory and logical reasoning, mature before emotional abilities, including the

¹⁵ N. Dosenbach, et al., Prediction of Individual Brain Maturity Using fMRI, 329 SCI. 1358-1361 (2011); D. Fair, et al., Functional Brain Networks Develop From a "Local to Distributed" Organization, 5 PLOS COMPUTATIONAL BIOLOGY 1-14 (2009); A. Hedman, et al., Human Brain Changes Across the Life Span: A Review of 56 Longitudinal Magnetic Resonance Imaging Studies, 33 HUM. BRAIN MAPPING 1987-2002 (2012); A. Pfefferbaum, et al., Variation in Longitudinal Trajectories of Regional Brain Volumes of Healthy Men and Women (Ages 10 to 85 Years) Measures with Atlas-Based Parcellation of MRI, 65 NEUROIMAGE 176-193 (2013); D. Simmonds, et al., Developmental Stages and Sex Differences of White Matter and Behavioral Development Through Adolescence: A Longitudinal Diffusion Tensor Imaging (DTI) Study. 92 NEUROIMAGE 356-368 (2014); L. Somerville, et al., A Time of Change: Behavioral and Neural Correlates of Adolescent Sensitivity to Appetitive and Aversive Environmental Cues, 72 BRAIN & COGNITION 124-133 (2010).

¹⁴ B. J. Casey, et al., Imaging the Developing Brain: What Have We Learned About Cognitive Development?, 9 TRENDS IN COGNITIVE Sci. 104-110 (2005).

¹⁴ For a recent review of this research, see: LAURENCE STEINBERG, AGE OF OPPORTUNITY: LESSONS FROM THE NEW SCIENCE OF ADOLESCENCE (2014).

¹⁷ T. Grisso, et al., Juveniles' Competence to Stand Trial: A Comparison of Adolescents^{*} and Adults' Capacities as Trial Defendants, 27 LAW & HUM. BEHAV. 333-363 (2003).

¹⁸ E. Cauffinan, et al., Age Differences in Affective Decision Making as Indexed by Performance on the Iowa Gambling Task, 46 DEV. PSYCHOL. 193-207 (2010); L. Steinberg, et al., Around the World, Adolescence is a Time of Heightened Sensation Seeking and Immature Self-Regulation, DEV. SCL Advance online publication. doi: 10.1111/desc.12532. (2017).

¹⁹ L. Steinberg, et al., Age Difference in Future Orientation and Delay Discounting, 80 CHILD DEV. 28-44 (2009); D. Albert, et al., Age Difference in Sensation Seeking and Impulsivity as Indexed by Behavior and Self-Report: Evidence for a Dual Systems Model, 44 DEV. PSYCHOL. 1764-1778 (2008).

ability to exercise self-control, to properly consider the risks and rewards of alternative courses of action, and to resist coercive pressure from others, Thus, one may be intellectually mature but also socially and emotionally immature.²⁰ As a consequence of this gap between intellectual and emotional maturity, these differences are exacerbated when adolescents and young adults are making decisions in situations that are emotionally arousing, including those that generate negative emotions, such as fear, threat, anger, or anxiety.²¹ The presence of peers also amplifies these differences because this activates the brain's "reward center" in individuals in their late teens and early twenties (20s) (Importantly, the presence of peers has no such effect on adults.²² In recent experimental studies, the peak age for risky decision-making was determined to be between nineteen (19) and twenty-one (21).²³) —

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- Recent neurobiological research parallels the above psychological conclusions. This research has shown that the main cause for psychological immaturity during adolescence and the early twenties (20s) is the difference in timing of the maturation of two important brain systems. The system that is responsible for the increase in sensation-seeking and reward-seeking- sometimes referred to as the "socio-emotional system"—undergoes dramatic changes around the time of puberty, and stays highly active through the late teen years and into the early twenties (20s). However, the system that is responsible for self-control, regulating impulses, thinking ahead,

²⁰ L. Steinberg, et al., Are Adolescents Less Mature Than Adults? Minors' Access to Abortion, the Juvenile Death Penalty, and the Alleged APA "Flip-Flop," 64 AM. PSYCHOLOGIST 583-594 (2009).

²¹ A. Cohen, et al., When is an Adolescent an Adult? Assessing Cognitive Control in Emotional and Non-Emotional Contexts, 4 PSYCHOLOGICAL SCIENCE 549-562 (2016); L. Steinberg, et al., Are Adolescents Less Mature Than Adults? Minors' Access to Abortion, the Juvenile Death Penalty, and the Alleged APA "Flip-Flop," 64 AM. PSYCHOLOGIST 583-594 (2009).

²² D. Albert, et al., The Teenage Brain: Peer Influences on Adolescent Decision-Making, 22 CURRENT DIRECTIONS IN FSYCHOL, Sci. 114-120 (2013).

²⁹ B. Braams, et al., Longitudinal Changes in Adolescent Risk-Taking: A Comprehensive Study of Neural Responses to Rewards, Pubertal Development and Risk Taking Behavior, 35 J. OF NEUROSCIENCE 7226-7238 (2015); E. Shulman & E. Cauffman, Deciding in the Dark: Age Differences in Intuitive Risk Judgment, 50 DEV. PSYCHOL. 167-177 (2014).

evaluating the risks and rewards of an action, and resisting peer pressure—referred to as the "cognitive control system"—is still undergoing significant development well into the mid-twenties (20s).²⁴ Thus, during middle and late adolescence there is a "maturational imbalance" between the socio-emotional system and the cognitive control system that inclines adolescents toward sensation-seeking and impulsivity. As the cognitive control system catches up during an individual's twenties (20s), one is more capable of controlling impulses, resisting peer pressure, and thinking ahead.²⁵—

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There are considerable structural changes and improvements in connectivity across regions of the brain which allow for this development. These structural changes are mainly the result of two processes: synaptic pruning (the elimination of unnecessary connections between neurons, allowing for more efficient transmission of information) and myelination (insulation of neuronal connections, allowing the brain to transmit information more quickly). While synaptic pruning is mostly complete by age sixteen (16), myelination continues through the twenties (20s).²⁶ Thus, while the development of the prefrontal cortex (logical reasoning, planning, personality) is largely finished by the late teens, the maturation of connections between the prefrontal cortex and regions which govern self-regulation and emotions continues into the mid-twenties (20s).²⁷ This supports the psychological findings spelled out above which conclude that even intellectual young adults

²⁴ B. J. Casey, et al., The Storm and Stress of Adolescence: Insights from Human Imaging and Mouse Genetics, 52 DEV. PSYCHOL. 225-235 (2010); L. Steinberg, A Social Neuroscience Perspective on Adolescent Risk-Taking, 28 DEV. REV. 78-106 (2008); L. Van Leijenhorst, et al., Adolescent Risky Decision-making: Neurocognitive Development of Reward and Control Regions, 51 NEUROIMAGE 345-355 (2010).

²⁵ D. Albert & L. Steinberg, Judgment and Decision Making in Adolescence, 21 J. OF RES. ON ADOLESCENCE 211-224 (2011); S-J Blakemore & T. Robbins, Decision-Making in the Adolescent Brain, 15 NAT. NEUROSCIENCE 1184-1191 (2012).

 ²⁶ S-J, Blakemore, Imaging Brain Development: The Adolescent Brain, 61 NEUROIMAGE 397-406 (2012); R. Engle, The Teen Brain, 22(2) CURRENT DIRECTIONS IN PSYCHOL. SCI. (whole issue) (2013); M. Luciana (Ed.), Adolescent Brain Development: Current Themes and Future Directions, 72(2) BRAIN & COGNITION (whole issue) (2010).
 ²⁷ L. Steinberg, The Influence of Neuroscience on U.S. Supreme Court Decisions Involving Adolescents' Criminal Culpability, 14 NAT. REV. NEUROSCIENCE 513-518 (2013).

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may have trouble controlling impulses and emotions, especially in the presence of peers and in emotionally arousing situations.

Perhaps one of the most germane studies to this opinion illustrated this development gap by asking teenagers, young adults (18-21), and mid-twenties adults to demonstrate impulse control under both emotionally neutral and emotionally arousing conditions.²⁸ Under emotionally neutral conditions, individuals between eighteen (18) and twenty-one (21) were able to control their impulses just as well as those in their mid-twenties (20s). However, under emotionally arousing conditions, eighteen- (18) to twenty-one- (21) year-olds demonstrated levels of impulsive behavior and patterns of brain activity comparable to those in their mid-teens.²⁹ Put simply, under feelings of stress, anger, fear, threat, etc., the brain of a twenty- (20) year-old functions similarly to a sixteen- (16) or seventeen- (17) year-old. —

(In addition to this maturational imbalance, one of the hallmarks of neurobiological development during adolescence is the heightened plasticity—the ability to change in response to experience—of the brain. One of the periods of the most marked neuroplasticity is during an individual's late teens and early twenties (20s), indicating that this group has strong potential for behavioral change.³⁰ Given adolescents' ongoing development and heightened plasticity, it is difficult to predict future criminality or delinquent behavior from antisocial behavior during the teen years, even among teenagers accused of committing violent crimes.³¹ In fact, many

 ²⁸ A. Cohen, et al., When is an Adolescent an Adult? Assessing Cognitive Control in Emotional and Non-Emotional Contexts, 4 PSYCHOL. SCI. 549-562 (2016).
 ²⁹ Id.

³⁰ LAURENCE STEINBERG, AGE OF OPPORTUNITY: LESSONS FROM THE NEW SCIENCE OF ADOLESCENCE (2014).
³¹ T. Moffitt, Life-Course Persistent Versus Adolescent-Limited Antisocial Behavior, 3(2) DEV. & PSYCHOPATHOLOGY (2016).

researchers have conducted studies finding that approximately ninety (90) percent of serious juvenile offenders age out of crime and do not continue criminal behavior into adulthood.³²

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Travis Bredhold was eighteen (18) years and five (5) months old at the time of the alleged crime. According to recent scientific studies, Mr. Bredhold fits right into the group experiencing the "maturational imbalance," during which his system for sensation-seeking, impulsivity, and susceptibility to peer pressure was fully developed, while his system for planning and impulse control lagged behind, unable to override those impulses. He also fit into the group described in the study above which was found to act essentially like a sixteen– (16) to seventeen– (17) year–old under emotionally arousing conditions, such as, for example, robbing a store. Most importantly, this research shows that eighteen– (18) to twenty-one– (21) year–olds are categorically less culpable for the same three reasons that the Supreme Court in *Roper* found teenagers under eighteen (18) to be: (1) they lack maturity to control their impulses and fully consider both the risks and rewards of an action, making them unlikely to be deterred by knowledge of likelihood and severity of punishment; (2) they are susceptible to peer pressure and emotional influence, which exacerbates their existing immaturity when in groups or under stressful conditions; and (3) their character is not yet well formed due to the neuroplasticity of the young brain, meaning that they have a much better chance at rehabilitation than do adults.³³

Further, the Supreme Court has declared several times that "capital punishment must be limited to those offenders who commit 'a narrow category of the most serious crimes' and whose extreme culpability makes them 'the most deserving of execution.'" *Roper*, 543 U.S. at 568

³² K. Monahan, et al., Psychosocial (im)maturity from Adolescence to Early Adulthood: Distinguishing Between Adolescence-Limited and Persistent Antisocial Behavior, 25 DEV. & PSYCHOPATHOLOGY 1093-1105 (2013); E. Mulvey, et al., Trajectories of Desistance and Continuity in Antisocial Behavior Following Court Adjudication Among Serious Adolescent Offenders, 22 DEV. & PSYCHOPATHOLOGY 453-475 (2010).

³³ Roper, 543 U.S. at 569-70.

(quoting Atkins, 536 U.S. at 319); Kennedy v. Louisiana, 554 U.S. 407 (2008) (holding that the Eighth Amendment prohibits the death penalty for the rape of a child where the crime did not result, and was not intended to result, in the death of the victim); Kansas v. Marsh, 548 U.S. 163, 206 (2006) (Souter, J., dissenting) ("the death penalty must be reserved for 'the worst of the worst'"). Given Mr. Bredhold's young age and development, it is difficult to see how he and others his age could be classified as "the most deserving of execution."

Given the national trend toward restricting the use of the death penalty for young offenders, and given the recent studies by the scientific community, the death penalty would be an unconstitutionally disproportionate punishment for crimes committed by individuals under twenty-one (21) years of age. Accordingly, Kentucky's death penalty statute is unconstitutional insofar as it permits capital punishment for offenders under twenty-one (21) at the time of their offense.

It is important to note that, even though this Court is adhering to a bright-line rule as promoted by *Roper* and not individual assessment or a "mental age" determination, the conclusions drawn by Dr. Kenneth Benedict in his individual evaluation of Mr. Bredhold are still relevant. This evaluation substantiates that what research has shown to be true of adolescents and young adults as a class is particularly true of Mr. Bredhold. Dr. Benedict's findings are that Mr. Bredhold operates at a level at least four years below that of his peers. These findings further support the exclusion of the death penalty for this Defendant.

So ORDERED this the _/_ day of August, 2017.

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JUDGE ERNESTO SCORSONE FAYETTE CIRCUIT COURT

Appendix C

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Article entitled "Around the World, Adolescence is a Time of Heightened Sensation Seeking and Immature Self-Regulation, " Developmental Science 00 (2017) DOI: 10.1111/desc.12532

PAPER

WILEY Developmental Science

Around the world, adolescence is a time of heightened sensation seeking and immature self-regulation

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Abstract

The dual systems model of adolescent risk-taking portrays the period as one characterized by a combination of heightened sensation seeking and still-maturing selfregulation, but most tests of this model have been conducted in the United States or Western Europe. In the present study, these propositions are tested in an international sample of more than 5000 individuals between ages 10 and 30 years from 11 countries in Africa, Asia, Europe and the Americas, using a multi-method test battery that includes both self-report and performance-based measures of both constructs. Consistent with the dual systems model, sensation seeking increased between preadolescence and late adolescence, peaked at age 19, and declined thereafter, whereas self-regulation increased steadily from preadolescence into young adulthood,

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reaching a plateau between ages 23 and 26. Although there were some variations in the magnitude of the observed age trends, the developmental patterns were largely similar across countries.

RESEARCH HIGHLIGHTS

- Adolescence has been described as a time of heightened sensation seeking and immature self-regulation, but few studies outside the United States and Western Europe have examined the developmental trajectories of these constructs.
- The present study examines age differences in sensation seeking and self-regulation in a sample of more than 5000 individuals between the ages of 10 and 30 from 11 culturally and economically diverse countries.
- Consistent with previous work, sensation seeking is higher during adolescence - peaking at age 19 - than before or after, whereas self-regulation continues to develop into the mid-20s.
- These patterns are strikingly similar across the 11 countries studied, and variations among countries in observed age trends are mainly in the magnitude of age differences rather than in the shape of developmental trajectories.

1. | INTRODUCTION

Over the past decade, research on adolescent behavior has been increasingly influenced by studies of adolescent brain development and, in particular, by perspectives on the adolescent brain that emphasize the different developmental trajectories of brain systems that govern incentive processing and cognitive control. In these so-called 'dual systems' (Steinberg, 2008) or 'maturational imbalance' (Casey, Getz, & Galvan, 2008) models, behavior during mid- and late adolescence is frequently described as the product of a developmental asynchrony between an easily aroused reward system, which inclines adolescents toward sensation seeking, and still maturing self-regulatory regions, which limit the young person's ability to resist these inclinations. This asynchrony is often invoked as an explanation for heightened risktaking during adolescence relative to childhood or adulthood. Some writers have described this imbalance as akin to starting a car's engines before a well-functioning braking system is in place.

Although the dual systems model has been critiqued as providing an oversimplified account of neurobiological development (e.g. Pfeifer & Allen, 2012) and being insufficiently attentive to the ways in which these brain systems interact (e.g. Casey, Galvan, & Somerville, 2016), research on psychological and behavioral development during adolescence is, by and large, consistent with this model. As Shulman and colleagues (2016) concluded in a recent review, evidence in favor of the model is strong. Sensation-seeking increases during the first half of adolescence and declines thereafter, following an inverted U-shaped function (Luciana & Collins, 2012). In contrast,

self-regulation - the capacity to deliberately modulate one's thoughts, feelings, or actions in the pursuit of planned goals (Smith, Chein, & Steinberg, 2013) - increases linearly and gradually during adolescence before plateauing in adulthood (Harden & Tucker-Drob, 2011). Selfregulatory capacities may reach adult-like levels at around age 15 in relatively less arousing, 'cool' contexts (Casey, 2015), but when tasks become more demanding or emotionally arousing, adult-like performance may not be reached until closer to the mid-20s (Cohen et al., 2016; Shulman et al., 2016; Veroude, Jolles, Croiset, & Krabbendam, 2013). These findings are consistent with a growing neuroimaging literature showing amplified activation of reward-processing regions (e.g. the ventral striatum and medial prefrontal cortex) in adolescents compared with children and adults (Luciana, Wahlstrom, Porter, & Collins, 2012), and gradual maturation over the course of adolescence and young adulthood within brain regions that subserve executive function (e.g. lateral prefrontal and parietal cortices and the anterior cingulate) (Casey, 2015).

A word about terminology is warranted. In the present article, we use the terms 'sensation seeking' and 'self-regulation' to each refer to a broad constellation of interrelated but operationally distinguishable constructs. As noted by Smith and colleagues (2013), within each broad category some constructs refer to the underlying neurobiology (e.g. reward sensitivity and cognitive control, respectively), some to the psychological indicators of this underlying biology (sensation-seeking and self-regulation), and some to the behavioral manifestations of these psychological traits (approach behavior and self-control). We recognize that, within these broad categories, constructs measured at different levels of analysis, or using different methods, are often only weakly correlated (i.e. it is common to find weak correlations between selfreport and behavioral measures of putatively similar constructs), but we believe that the overarching categories provide helpful heuristics. We have chosen the labels 'sensation seeking' and 'self-regulation' because these terms are commonly used in developmental psychological research (Duckworth & Steinberg, 2015).

Although the developmental trajectories of sensation seeking and self-regulation have been observed in many studies that have employed a variety of methods and measures, most of the relevant research has been carried out in the United States and a handful of Western European nations (especially the Netherlands; e.g. Peters, Jolles, van Duijvenvoorde, Crone, & Peper, 2015; van Duijvenvoorde et al., 2014; Van Leijenhorst et al., 2010). In the present study, we ask whether the inverted U-shaped pattern that characterizes the development of sensation seeking between childhood and adulthood and the gradual increase in self-regulation over the course of adolescence are observed in other parts of the world. We examine this question using a mixture of behavioral tasks and self-reports, in order to better capture the multidimensional nature of each construct.

There are arguments to be made on both sides as to whether trajectories of sensation seeking and self-regulation during adolescence are universal or culturally variable. On the one hand, the dual systems view derives explicitly from a neurobiological perspective on adolescence that links developmental changes and age differences in sensation seeking and self-regulation to changes in brain structure and function that are assumed to be universal (or near-universal) features of adolescent development (Spear, 2013). This is especially true with respect to changes in reward processing, which are thought to be caused by changes in dopaminergic activity as a consequence of the impact of pubertal hormones on the brain's reward-processing system (Luciana et al., 2012). Changes in cognitive control systems, in contrast, have been posited to be relatively more subject to environmental experience (see Smith et al., 2013). Normative maturation of crucial structures of these systems, such as the lateral prefrontal cortex, is assumed to play a significant role in the development of self-regulation between childhood and adulthood (Casey, 2015). To the extent that the imbalance hypothesized within the dual systems perspective is a biological given, it should be seen cross-culturally.

On the other hand, there is reason to think that patterns of age differences in sensation seeking and self-regulation vary across cultures. Adolescence is a stage of development in which there are substantial differences among cultures in expectations, socialization practices, and the structure of social institutions (Larson, Wilson, & Rickman, 2009). In some parts of the world, such as the United States, adolescence is viewed as a time during which the display of exuberance, novelty seeking, and experimentation with exciting experiences is not only normative, but desirable (Palladino, 1996). This is consistent with standardized ratings of countries along the dimension of 'Indulgence-Restraint', which refers to the extent to which societies encourage individuals to satisfy hedonic goals (Hofstede, 2011). Both the United States and the Netherlands, where the bulk of research into age differences in sensation seeking and self-regulation has been carried out, score high on indulgence relative to other countries, particularly those in Asia (e.g. China and India) and Eastern Europe (e.g. Ukraine and Romania) (Hofstede, Hofstede, & Minkov, 2010). In a culture that accepts (or even encourages) self-gratification in its young people, it is hardly surprising that sensation seeking is especially pronounced and self-regulation still immature during this phase of development. Thus, the pattern of age differences in sensation seeking and self-regulation described in the literature is culturally consistent with the expectations for adolescents in the societies in which most of the research has been conducted.

Not all parts of the world share this vision of adolescence as a time of carefree recklessness. In many non-Western cultures, especially those in Asia, self-regulation is demanded from children at an early age, and adolescence is not a time of exploration, self-indulgence and novelty seeking, but of buckling down to prepare for adult life (Chaudhary & Sharma, 2012; Chen, Cen, Li, & He, 2005; Weisz, Chaiyasit, Weiss, Eastman, & Jackson, 1995). Experimentation with drinking, drug use and premarital sex is neither accepted nor viewed as normative in many non-Western cultures (Haddad, Shotar, Umlauf, & Al-Zyound, 2010; Rehm et al., 2003). In these contexts, heightened sensation Developmental Science

seeking or immature self-regulation may not be characteristic of adolescence. Indeed, we might expect far less change in these aspects of psychological functioning during adolescence, because expectations for self-regulation are already high prior to adolescence and because this period is not one in which excessive sensation seeking is tolerated, much less encouraged.

The current paper presents the findings of a cross-sectional, multinational, multi-method study of behavioral and psychological development during the second two decades of life in a sample of approximately 5000 individuals. Participants came from 11 countries (China, Colombia, Cyprus, India, Italy, Jordan, Kenya, the Philippines, Sweden, Thailand, and the United States). Using self-report and behavioral measures, we investigated age differences in sensation seeking and self-regulation. We asked two main questions. First, are patterns of age differences in sensation seeking and self-regulation similar in a multinational sample to those that have been reported in previous studies of American and European individuals? Second, within this multinational sample, how do developmental trajectories differ across disparate contexts? To answer this latter question, we compared patterns of age differences across the 11 countries.

2 | METHODS

2.1 | Participants

The sample for the present analyses (N = 5404) comprised between 407 and 570 individuals between the ages of 10 and 30 years from each of 11 locales: Guang-Zhou and Shanghai, China (N = 493); Medellin, Colombia (N = 513); Nicosia, Cyprus (N = 407); Delhi, India (N = 425); Naples and Rome, Italy (N = 561); Amman and Zarqa, Jordan (N = 506); Kisumu, Kenya (N = 488); Manila, the Philippines (N = 512); several cities in the west of Sweden (N = 425); Chang Mai, Thailand (N = 504); and Durham and Winston-Salem, the United States (N = 570). The gender balance was nearly even within the whole sample (49.2% male, n = 2658; 50.8% female, n = 2746), within each country (range: 48.9–53.8% female), and across age groups (range: 48.7–52.0% female). Most of the 10–11-year-olds were participants in an ongoing study of parenting across cultures (PAC) that is being conducted in all of these locales except Cyprus and India (Lansford & Bornstein, 2011).

The PAC countries were originally selected because they differ markedly in how children are disciplined, a primary focus of that project. This focus resulted in a sample of countries that is diverse along several socio-demographic dimensions, including predominant race/ ethnicity, predominant religion, various economic indicators, and indices of child well-being. For example, on the Human Development Index, a composite measure of a country's status with respect to health, education and income, participating countries ranged from a rank of 5 (United States) to 147 (Kenya) out of 187 countries with available data (United Nations Development Programme, 2014). The participating countries varied widely not only on socio-demographic indicators, but also on psychological constructs such as individualism versus collectivism, which is likely to influence how adolescents and adults make - Developmental Science

day-to-day decisions, and on the dimension of 'Indulgence-Restraint', which, as we noted earlier, is likely to influence both sensation seeking and self-regulation. Ultimately, this diversity provided us with an opportunity to examine our research questions in a sample that is more generalizable to a wider range of the world's populations than is typical in most research on adolescent development. Although there are ethnic minorities in each of the participating countries, participants did not identify themselves as being members of any ethnic minority groups except in the United States, where we deliberately enrolled a mix of Black, Latino, and White participants.

All participants were recruited from the same neighborhoods as the children in the PAC study; in Cyprus and India, which are not in the PAC study, we recruited from neighborhoods similar to those used in the PAC study. In each country, the sample was recruited to yield an age distribution designed to replicate the age distribution of an American sample who had been studied previously using a similar test battery (see Steinberg et al., 2008, for a description). Many contemporary scholars define adolescence as beginning with puberty and ending when individuals have made the transition into adult roles. The 10-30 age range in this study allows us to capture this age period while allowing for worldwide variation in the age of pubertal onset and the age of transition into adulthood. In order to have cells with sufficiently large and comparably sized subsamples for purposes of data analysis, each study site attempted to recruit at least 30 males and 30 females from each of seven age groups: 10-11 years, 12-13 years, 14-15 years, 16-17 years, 18-21 years, 22-25 years and 26-30 years (see Table 1 for the distribution of participants across age groups by country). Across countries, participants came from households with comparable levels of parental education, which averaged some college.

Participants were recruited via flyers posted in neighborhoods, schools, advertisements placed in newspapers, and word of mouth. Because of this recruitment method, we cannot determine whether those who responded to recruitment advertisements differed from those who did not. Informed consent was obtained for all participants aged 18 and older. Parental consent and adolescent assent were obtained for all youth under 18 except in Sweden, where parental consent is not required for youth of 15 years and older. Local Institutional Review Boards (IRBs) approved all procedures.

2.2 | Procedures

Research staff in all countries underwent identical training procedures. Participants completed a 2-hour session that included several computerized tasks, computerized self-report measures, a demographic questionnaire, computerized tests of executive functions, and a measure of intellectual ability. These sessions were completed individually in participants' homes, schools, or other suitable locations (e.g. community centers) designated by the participants. Measures were administered in the predominant language at each site, following forward- and back-translation and meetings to resolve any item-by-item ambiguities in linguistic or semantic content (Erkut, 2010; Maxwell, 1996). Translators were fluent in English and the target language. In addition to translating the measures, translators were asked to note items that did not translate well, were inappropriate for the participants, were culturally insensitive, or elicited multiple meanings, and to suggest improvements. Site coordinators and translators reviewed the discrepant items and made appropriate modifications. Measures were administered in Mandarin Chinese (China), Spanish (Colombia and the United States), Italian (Italy), Arabic (Jordan), Dholuo (Kenya), Filipino (the Philippines), Greek (Cyprus), Hindi (India), Swedish (Sweden), Thai (Thailand), and American English (India, Kenya, the Philippines and the United States).

In order to keep participants engaged in the assessment, they were told that they would receive a base payment for participating in the study, and that they could obtain a bonus (equal to approximately 50% of the base payment) based on their performance on the computer tasks. In actuality, all participants received the bonus. In the United States, the base payment was US\$30 and the bonus was US\$15. In other countries, the principal investigators and site coordinators (with the approval of the local IRB) determined the amount of an appropriate base payment, taking into account the local standard of living and minimum wage, and ensuring that the amount was sufficient to

| 保持公共 | 10-11 | 12-13 | 14-15 | 16-17 | . 18-21 | 22-25 | 26-30 | Total |
|--------|-------|-------|-------|-------|---------|-------|-------|-------|
| China | 109 | 61 | 60 | 60 | 79 | 59 | 60 | 488 |
| Italy | 184 | 60 | 63 | 58 | - 59 | 59 | 61 | 544 |
| Келуа | 93 | 77 | 68 | 58 | 60 | 61 | 63 | 480 |
| Phil. | 114 | 63 | 62 | 62 | 72 | 68 | 63 | 504 |
| Thai. | 131 | 84 | 60 | 44 | 68 | 64 | 51 | 502 |
| Sweden | 53 | 58 | 60 | 61 | 60 | 60 | 59 | 411 |
| US | 164 | 61 | 60 | 58 | 67 | 61 | 66 | 537 |
| Colom. | 140 | 59 | 61 | 59 | 57 | 59 | 58 | 493 |
| Jordan | 86 | 58 | 58 | 56 | -56 | 61 | 54 | 429 |
| India | 55 | 59 | 61 | 59 | 59 | 61 | 60 | 414 |
| Cyprus | 32 | 37 | 33 | 40 | 61 | 48 | 52 | 303 |
| Total | 1161 | 677 | 646 | 615 | 698 | 661 | 647 | 5105 |

TABLE 1 Distribution of participants across age groups by country

Note. Phil., Philippines; Thai, Thailand, US, United States; Colom., Colombia.

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encourage participation in the study but not so large so as to be coercive. [The Swedish university participating in the study did not permit research subjects to be paid in cash, so participants were given three movie tickets (two as the base payment and one as a bonus) as compensation.] At the end of testing, participants were debriefed regarding this deception in countries where local IRBs deemed this disclosure necessary.

Following each assessment, the interviewer answered a series of five questions that asked about the participant's engagement in the assessment and the quality of the data. A small number of assessments (3.2%, N = 172) were rated as unusable (e.g. the participant did not appear to understand the questions or tasks, did not pay attention to instructions, or was obviously disengaged); these cases were dropped from the sample. After accounting for unusable assessments and missing data on certain key variables (see the subsequent discussion on 'Missingness'), the final sample comprised 5105 participants (2578 females, M age = 17.08, SD = 5.92) (see Table 1). All analyses were conducted using Mplus (Version 7.31; Muthén & Muthén, 1998–2010).

2.3 | Measures

Of central interest in this report are a demographic questionnaire, an assessment of intelligence, and six outcome variables: three indexing sensation seeking, and three indexing self-regulation. In the interest of brevity, measures that were included in prior studies are not described in detail here; readers are directed to prior publications and to the Supporting Information that accompanies this article for additional information.

2.3.1 | Demographic questionnaire

Participants reported their age, gender, and the level of education of each of their parents. We used the average level of the participant's parents' education (i.e., highest grade completed from 0 to grade 12, with some college coded as 13, a college diploma = 14, and education beyond college = 15) to characterize the home environment during the participant's formative years (i.e., even for our adult participants, we used parental education, rather than the individual's educational attainment, as our index) (for a discussion of this strategy, see Steinberg, Mounts, Lamborn, & Dombusch, 1991). In some locales, there were small differences between age groups in average levels of parental education, often with relatively lower average parental education reported by the older participants, whose parents had grown up at a time when postsecondary enrollment was less common, especially among women. Accordingly, we controlled for parental education in all analyses.

2.3.2 | Intelligence

The Matrix Reasoning subtest of the Wechsler Abbreviated Scale of Intelligence (WASI) (Psychological Corporation, 1999), administered on a laptop, was used to produce an estimate of *nonverbal intellectual ability*. (Given the variability in language across the research sites, we - Developmental Science

used only the Matrix Reasoning subscale.) The WASI has been normed for individuals between the ages of 6 and 89 years; an age-normed score (t-score) was computed for each participant. Participants' WASI scores, because they were obtained via computer administration, may not be comparable to scores from traditionally administered WASIs. Nevertheless, we were able to use these scores to control for any age-group differences in general intellectual functioning that might influence task performance.

2.3.3 | Sensation-seeking composite

Three measures were used to index sensation seeking: the Iowa Gambling Task, self-reported sensation seeking, and the Stoplight game. Scores on these measures were standardized and averaged to form a composite measure of sensation seeking. In order to generate coefficients with interpretable decimal values, sensation-seeking composite values were multiplied by 100.

Modified Iowa Gambling Task

Inherent in the definition of sensation seeking is the tendency for individuals to pursue activities that are perceived as potentially rewarding. The lowa Gambling Task was used to generate a measure of reword approach. In the present study, the standard lowa Gambling Task (IGT: Bechara, Damasio, Damasio, & Anderson, 1994) was modified in two key ways. First, participants made a play-or-pass decision with regard to one of four decks pre-selected on each trial, rather than being free to draw from any of four decks (see Cauffman et al., 2010 for details). This modification afforded us the ability to track independently affinity for advantageous decks and avoidance of disadvantageous ones (Peters & Slovic, 2000). Second, whereas gains and losses of a single card were presented simultaneously and separately in the original IGT (e.g. 'you won \$100', 'you lost \$300'), our modified version presented only the net amount for each card (e.g. 'you lost \$200'). As in the original task, two of the decks are advantageous and result in a monetary gain over repeated play, while the other two decks are disadvantageous and produce a net loss over repeated play. On each trial, one of the four decks was highlighted with an arrow, and participants were given 4 s to decide to play or pass on that card. If the participant chose to play, a monetary outcome was displayed on the current card, and the total amount of money earned up to and including that trial was updated on the screen. If the participant chose to pass, no feedback was provided, and the next card appeared. (If the participant did not respond one way or the other within 4 s, the trial was considered invalid.) The task was administered in six blocks of 20 trials each. In order to quantify reward approach, we computed the change, from the first to the last block of the task, in the percentage of times the participant chose to play on advantageous decks when given the chance. Higher scores reflect greater reward approach.

Self-reported sensation seeking

Self-reported sensation seeking was assessed using a subset of six items from the Sensation Seeking Scale (Zuckerman, 1994). Many of the items on the full 19-item Zuckerman scale appear to measure impulsivity (e.g., 'I often do things on impulse'). In light of our interest in

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distinguishing between impulsivity and sensation seeking, our measure included only the items that clearly indexed thrill- or noveltyseeking (sample item: 'I like doing things just for the thrill of it'; see Steinberg et al., 2008). All items were answered as either true or false. Reliability for the whole sample on this six-item scale was α = .63, with reliabilities for separate countries ranging from .49 (Kenya) to .78 (India). Confirmatory factor analysis indicated good model fit for this scale (χ^2 [9] = 165.51, *p* < .0001, RMSEA = .058, 90% CI [.051, .066], CFI = .96, TLI = .94). For purposes of analysis, self-reported sensationseeking scores were multiplied by 100 (creating a lower limit of '0' and an upper limit of '100').

Stoplight game

Also inherent in the notion of sensation seeking is the willingness of individuals to pursue rewards even when some degree of risk is involved. The Stoplight game (Steinberg et al., 2008) was employed to generate a measure of risky driving. The player was asked to 'drive' a car to a party at a distant location in as little time as possible, passing through 20 intersections, each marked by a traffic signal. The participant's vantage point was that of someone behind the wheel, with the road and roadside scenery visible. Before playing, participants were informed that when approaching an intersection in which the traffic signal turns yellow, they must decide whether to stop the car (using the space bar) and wait for the light to cycle back to green, or to attempt to cross the intersection. Participants could not control the car's speed, and the 'brakes' only worked after the light turned yellow. Participants were told that one of three things may happen depending on their decision: (1) if brakes are not applied and the car passes through the intersection without crashing, no time is lost; (2) if brakes are applied before the light turns red, the car will stop safely, but 3 s will be lost waiting for the green light; or (3) if brakes are not applied or are applied too late, and the car crashes (accompanied by squealing tires, a loud crash, and the image of a shattered windshield), more time will be lost (approximately 6 s). Participants must decide whether to drive through the intersection in order to save time (but risk losing time if a crash occurs), or to stop and wait (and willingly lose a smaller amount of time). The outcome variable of interest was risky driving, defined as the proportion of intersections the participant entered without braking. This measure has been shown to be correlated with self-reported sensation seeking (Steinberg et al., 2008).

In the present sample, intercorrelations among the measures of sensation seeking were as follows: IGT reward approach and self-reported sensation seeking, r = .03, p < .05; IGT reward approach and Stoplight, r = .04, p < .01; and self-reported sensation seeking and Stoplight, r = .07, p < .001.

2.3.4 | Self-regulation composite

Three measures were used to index self-regulation: the Stroop task, self-reported planning, and the Tower of London task. Scores on these measures were standardized and averaged to form a composite measure of self-regulation. In order to generate coefficients with interpretable decimal values, self-regulation composite values were multiplied by 100.

Stroop task

A fundamental aspect of self-regulation is the ability to suppress a conditioned or automated (prepotent) response, and many tasks measuring response inhibition require participants to respond to a specific stimulus presented frequently but to refrain from responding to the rare occurrence of another. A computerized version of the classic Stroop color-word task was administered to assess prepotent *response inhibition* (Banich et al., 2007; see Albert & Steinberg, 2011, for details of this version). On each trial, the participant was presented either a color-word (e.g. 'BLUE', 'YELLOW') or a non-color word (e.g. 'MATH', 'ADD') and instructed to identify the color in which the word is printed (while ignoring the semantic meaning of the word) by pressing a corresponding key as quickly as possible. In this version of the task, all color-word trials are incongruent, such that the color of the ink in which the word is printed does *not* match the semantic meaning of the word (e.g. the word 'BLUE' printed in yellow).

Participants completed two 48-trial experimental blocks. The first block included an equal mix of neutral and incongruent trials, and the second block included a greater number of neutral than of incongruent trials. Success on this task relies on one's ability to maintain an abstract goal (respond with the ink color) and inhibit one's inclination to respond to the word's meaning. In order to extract a measure of self-regulation, we computed the percentage of correct responses on incongruent trials (i.e. in which there was a conflict between the color word and the color of the font in which it was printed) within blocks containing relatively fewer incongruent trials, which were therefore more likely to cause interference. Higher scores indicated better response inhibition.

Self-reported planning

Six items from the impulsivity subset of the Zuckerman Sensation Seeking Scale (SSS; Zuckerman, 1994) were used to compute a measure of self-reported planning. [Although the SSS is used primarily to assess sensation seeking, many of the items actually measure impulse control (for a discussion, see Steinberg et al., 2008).] Items included in the impulse control subset reflect a lack of planning (e.g., 'I tend to begin a new project without much planning on how I will do it', reversed) and acting without thinking (e.g., 'I often act without thinking', reversed). Two additional items comprising the impulsivity subset appear (on their face) to be more closely related to our conceptualization of sensation seeking [i.e. 'I enjoy getting into new situations where I can't tell whether it will end up bad or good' and 'I often get so carried away by new and exciting things and idea that I never think of possible problems that might happen' (emphasis added)) and were therefore omitted from our calculation of the planning score. All items were answered as either True (coded 1) or False (coded 0), and item scores were averaged. Higher scores reflect stronger planning. Planning scores were strongly correlated with other measures of similar constructs assessed in the present test battery (e.g. planning was positively correlated with the 'planning ahead' subscale of the Future Orientation Scale, r = .50, p < .001; Steinberg et al., 2009). Reliability for the whole sample on this six-item scale was $\alpha = .63$, with reliabilities for individual countries ranging from .47 (Colombia) to .73 (India).

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Confirmatory factor analysis indicated good model fit for this scale $(\chi^2[9] = 142.33, p < .0001, RMSEA = .054, 90\% CI [.046, .062], CFI = .97, TLI = .95). For purposes of analysis, self-reported planning scores were multiplied by 100 (creating a lower limit of '0' and an upper limit of '100').$

Tower of London task

A computerized version of the Tower of London task (Shallice, 1982) was used to generate a measure of impulse control (Steinberg et al., 2008). One of the capacities assessed by the Tower of London task is whether one can inhibit acting before a plan is fully formed. The participant is presented with pictures of two sets of different-colored balls and three empty rods, one of which can hold three balls, one two balls, and the last, only one ball. The first picture shows the starting position of the three balls, and the second depicts the goal position. The participant is asked to move the balls in the starting arrangement. onto and between the rods to match the goal arrangement in as few moves as necessary. Five sets of four problems are presented, beginning with four that can be solved in three moves and progressing to those that require a minimum of seven moves. Impulse control was indexed as the average time (in milliseconds) between the presentation of each difficult problem (i.e., those requiring a minimum of six or seven moves to complete) and the participant's first move. Longer latencies to first move indicate greater impulse control.

In the present sample, intercorrelations among the measures of self-regulation were as follows: Stroop and self-reported planning, r = .04, p < .01; Stroop and Tower of London, r = .07, p < .001; and self-reported planning and Tower of London, r = .08, p < .001.

2.3.5 Measurement invariance of self-report scales

In order to ensure that self-report measures of sensation seeking and planning were appropriate to use within our culturally diverse sample, we tested for measurement invariance of factor loadings and intercepts across the 11 countries using the alignment technique (Muthén & Asparouhov, 2014). (Details on this procedure are provided in the Supporting Information.) As per the guidelines provided by Muthén and Asparouhov (2014), approximate measurement invariance can be assumed if fewer than 25% of the parameters are non-invariant for a given measure. In our two self-report measures (sensation seeking and planning), no more than 14% of parameters – intercepts as well as loadings – were non-invariant (see Tables S1 and S2). These results suggest that these questionnaires are reliable across countries in our sample.

2.4 | Data analysis

2.4.1 | Missingness

In order to minimize bias resulting from outliers, scores on any outcome variable that were greater than 3.5 standard deviations from the mean were recoded as missing (see below for details). As noted earlier, a small number of assessments (3.18%, N = 172) were rated Developmental Science

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as unusable by the interviewer and excluded from analyses. Of the remaining 5232 cases, 2 participants (.04%) were missing age, 95 (1.80%) were missing data on parental education, and 43 (.82%) were missing WASI scores. Participants with missing data on these demographic variables were excluded from analysis. Of the final analytic sample of 5105 participants, 21 (.41%) were missing IGT data, 5 (.10%) lacked a self-reported sensation-seeking score, 3 (.10%) lacked a self-reported planning score, 143 (2.80%) lacked Stoplight data, 379 (7.42%; 72 of these cases were outliers recoded as missing) were missing Tower of London data, and 119 (2.31%; 87 of these cases were outliers recoded as missing) were missing Stroop data. Full-information maximum likelihood (FIML) within Mplus was used to reduce bias owing to missing data on these variables. Because some variables were negatively skewed (i.e., latency to first move on the Tower of London) or positively skewed (i.e., self-reported planning and accuracy on Stroop), we used bootstrapped standard errors (3000 resamples) in assessing statistical significance and computing confidence intervals.

2.4.2 | Centering independent variables

All independent variables were centered so that coefficients and intercepts reflected meaningful values within the range of the sample. WASI scores and parental education were centered at their respective means. Age was centered at 18 years.

2.4.3 | Main effects

A series of regression analyses were completed to investigate age trends within the whole sample for both composite variables (the sensation-seeking composite and the self-regulation composite) and for all six component variables (i.e., reward approach on the IGT, self-reported sensation seeking, risky driving in the Stoplight game, response inhibition on the Stroop task, self-reported planning, and impulse control on the Tower of London task). Age and age² were entered as predictors to test for quadratic trends, specifically, a rise (during adolescence) and fall (into adulthood) in sensation seeking, and an increase across adolescence and into adulthood in self-regulation. If the quadratic term was not significant, the linear effect of age was tested (absent the quadratic term). All analyses controlled for parental education and WASI t-score. Owing to space considerations, and in light of previous research indicating that developmental trajectories of sensation seeking and self-regulation are quite similar among males and females (Shulman, Harden, Chein, & Steinberg, 2015), we elected not to conduct analyses separately by gender.

2.4.4 | Differences among countries

We used multiple-group structural equation models to test for differences in age trends among countries in the composite variables and in each of the six component variables. Results for the composites are reported in the main text; results for the component variables can be found in the Supporting Information. WILEY- Developmental Science

| 的形式 | Par. Ed. | WASI | SR SS | ign - | Stoplight | SR Plan | Stroop | ToL |
|-----------|----------|--------|--------|-------|-----------|----------------------------------|--------|--------|
| Age | 07*** | .14 | .02 | .04 | 04* | .07*** | .20*** | .19 |
| Par. Ed. | - | .20*** | .08*** | .04 | ,004 | .00 | 01 | .02 |
| WASI | | - | .01 | .10 | .06 | .10 | .19*** | .19 |
| SR SS | | | - | .03* | .07 | 26 | .04" | 02 |
| IGT | | | | - | .04** | 03° | .09*** | .05** |
| Stoplight | | | 5.7 | | - | 03 | .05*** | .03 |
| SR Plan | | | | | | - | .04 | .08*** |
| Stroop | | | • | | | Street in the second low or - 11 | - | .07 |

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Note. Par. Ed., parental education; WASI, WASI t-score; SR SS, self-reported sensation seeking; IGT, iowa Gambiing Task; SR Plan, self-reported planning; ToL, Tower of London task.

*p < .05; **p < .01; ***p < .001.

For each outcome, we first specified a 'constrained' model, in which the effects of all predictors were set to be equal across countries. We then examined the change in chi-square between this model and a comparison model in which the effects of age and age² were free to vary across country. If model fit was significantly worse in the constrained model than in the comparison model (indicated by a change in χ^2 of 31.41 or greater, corresponding to a 20-unit change in parameters), we deduced that there were significant differences across groups on at least one of the parameters that were free to vary across groups in all models. Covariates were constrained across groups unless otherwise noted.

In cases where chi-square difference testing yielded significant results (indicating significant variation in age patterns across countries), we conducted further analyses to characterize these differences. To do so, we examined whether each country's age pattern – with respect to either sensation seeking or self-regulation – differed from the pattern, on average, of the other 10 countries considered in the aggregate. Accordingly, we conducted a series of analyses comparing two groups: one containing the individual country, and the other containing the other 10 countries. Using 2-df chi-square difference testing, we compared a model in which age and age² were constrained to be equal across the two groups and a model in which they were free to vary. A significant change in chi-square value (i.e., greater than 5.99) indicated that the individual country differed from the overall age pattern of a given construct.

Finally, we described the shape of the average age-related pattern (i.e., linear, curvilinear, etc.) for each country for each outcome. Because we were interested in exploring age patterns within countries, we standardized the six measures that make up the composites separately for each country and averaged these values to form the composite variables used in these analyses. Regression analyses were fit separately for each country.

3 | RESULTS

3.1 | Main effects

Intercorrelations are presented in Table 2. Means and standard deviations for all variables are reported in Table 3. Results for the sensation-seeking and self-regulation composite variables are reported here; results for each component variable are found in the Supporting Information. Descriptive information broken down by country is available from the authors.

As expected, the age pattern of the sensation-seeking composite within the whole sample followed an inverted-U pattern ($b_{age} = 0.35$, SE = 0.15, p = .02; $b_{age}^2 = -0.19$, SE = 0.03, p < .001), increasing across adolescence, peaking at around age 19, and subsequently declining into adulthood (see Table 4). By comparison, the age pattern of self-regulation increased until the early to mid-20s ($b_{age} = 2.60$, SE = 0.15, p < .001; $b_{age}^2 = -0.20$, SE = 0.03, p < .001) without a marked decrease thereafter. Figure 1 displays the age trends and confidence intervals of both composites, centered at age 10 to show relative changes in the constructs from the youngest age onward.

3.1.1 | Post hoc probing

Central to our model is the proposition that sensation seeking peaks in mid- to late adolescence and subsequently declines into adulthood, whereas self-regulation increases into late adolescence or adulthood and subsequently stabilizes. Visual inspections of the age patterns in the sample as a whole were consistent with these predictions. However, in order to better describe the differences in the age trends of these constructs, we first identified the age at which the estimated value of each construct was highest. Then we tested whether, beyond the age of the highest value, scores on the relevant measure of the construct decreased linearly with age, consistent with the rise-and-fall pattern expected for sensation seeking, or failed to change with age, consistent with the plateau expected for self-regulation.

By iteratively re-estimating our models with age re-centered at each year, we were able to identify the age (in whole years) at which each construct's estimated value was highest. Sensation seeking peaked at age 19, consistent with visual inspection. An analysis of the effects of age after this peak (i.e., those aged 20 to 30, N = 1659) indicated that sensation seeking decreased significantly from age 20 to 30 ($b_{age} = -2.00$, SE = 0.47, p < .001) (see bottom of Table 4). In contrast, self-regulation peaked at age 24, but did not change significantly after age 25, remaining at the same level until age 30 (N = 802; $b_{age} = -0.77$, SE = 1.40, p = .59).

TABLE 2 Zero-order correlations among variables

| | 14-14-14-14-14-14-14-14-14-14-14-14-14-1 | SPATISTICS (SPATISTICS) | 14715 S | 1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1. | 10-21 - 10-21 | × 22-25 | 26-30 |
|--|---|--|--|--|---|--|---|
| Age (years) | 10.54 (0.50) | 12.36 (0.48) | 14.48 (0.50) | 16.48 (0.50) | 19.49 (1.12) | 60021.0000000000000000000000000000000000 | 產品回点去。(約1.4.4.4.4.4.4.4.4.4.4.4.4.4.4.4.4.4.4.4 |
| Parental Education | 11.84 (3.00) | 12.07 (2.91) | 12.12 (2.78) | 11.85 (2.88) | 12.00 (2.79) | 11.78 (3.03) | 11 22 (1 25) |
| WASI t-score | 48.42 (10.97) | 46.02 (11.11) | 46.15 (10.90) | 46.98 (10.55) | 49.85 (10.40) | 51.32 (10.21) | 51 40111 651 |
| Self-Reported SS | 56.02 (27.38) | 57.49 (28.10) | 56.83 (30.14) | 61.56 (27.84) | 62.20 (27.67) | 60.11 (27 72) | VPL BC/ 91 245 |
| Reward Approach (IGT) | 5.44 (22.49) | 5.99 (21.64) | 5.99 (22.52) | 7.49 (22.33) | 8.79 (20.15) | R.31 (21.35) | 7 07 (77 BC) |
| Risky Driving (Stoplight) | 41.70 (21.78) | 41.58 (20.95) | 44.95 (22.74) | 42.22 (21.39) | 43.53 (22.65) | 47 41 (22 85) | (C0.27) /0.1 |
| Response Inhibition (Stroop) | 85.73 (14.01) | 88.34 (12.498) | 90.71 (11.63) | 92.17 (10.54) | 93.08 (10.01) | (CC-1) 11-1-1 | (11.07) 41.00 |
| Self-Reported Planning | 69.61 (24.71) | 69.75 (25.485) | 68.21 (27.75) | 69.84 (26.87) | 72.66 (27.23) | 74.43 (26.40) | (1//OL) (7-7/ |
| Impulse Control (ToL) | 4367.89 (2702.05) | 4340.42 (2735.57) | 5087.87 (4363.35) | 5265.16 (4354.17) | (127.77 (4703.61) | 6243.98 (4595.54) | 19 12231 2012 |
| Note. WASI, WASI t-score; IGT, Iowa to first move. Values for risky driving | Gambling Task, indicates on the Stoplight task ind | the percentage Increa icate the percentage of | se In draws from advanta lights run. Values for res | geous decks from block porse inhibition on the | 1 to block 6; ToL, Tower c troop task indicate perce | of London task, Indicates Intage of accurate respon | atency, in millisecon |

3.2 | Differences among countries

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The omnibus chi-square difference tests indicated that the effects of age were not the same in all 11 countries for either the sensationseeking composite $[\Delta\chi^2(20) = 46.91, p < .05]$ or the self-regulation composite $[\Delta\chi^2(20) = 95.76, p < .05]$. In order to explore these differences, we compared the effects of age and age² within each individual country (one at a time) to the average observed in the 10 other countries.

The results of these analyses indicated that in China, Italy, Jordan and the Philippines, the age-related pattern for sensation seeking differed significantly from the aggregate of the other countries (see Table S3 for comparisons and quadratic age trends). Although the age effects observed in China, Italy and the Philippines differed from those of the aggregate, sensation seeking nevertheless followed an inverted U-shaped pattern across age in each of these countries. In Jordan, however, sensation seeking increased linearly with age ($b_{age} = 1.38, SE$ = 0.52, p = .007). Thus, all but one of the deviations from the average age pattern reflected differences in the magnitude of the curvilinear pattern (i.e. as seen in China, Italy and the Philippines), rather than in the general shape of the age trend (as seen in Jordan).

With regard to self-regulation, the age patterns of China, India, Italy, Jordan, Sweden and the United States each differed from the aggregate of the other countries (see Table S4 for comparisons and quadratic age trends). Self-regulation increased across adolescence and plateaued in China, Italy and the United States, as it did in general,

TABLE 4 Sensation-seeking and self-regulation composite results: whole sample

| Sensation-S | 95 | 95% CI | | | | |
|--------------------------|----------|--------|---------|-------|-------|--|
| | Estimate | SE | p-value | LB | UB | |
| Age | 0.35 | 0.15 | .02 | 0.06 | 0.64 | |
| Age ² | -0.19 | 0.03 | <.001 | -0.24 | -0.14 | |
| Parent Ed. | 0.82 | 0.31 | .01 | 0.22 | 1.43 | |
| WASI | 0.49 | 0.08 | <.001 | 0.33 | 0.66 | |
| Post-Peak A | nalysis | | | 95 | % CI | |
| Age Range | Estimate | SE | p-value | LB | UB · | |
| 20-30 | -2.00 | 0.47 | <.001 | -2.91 | -1.07 | |
| Self-Regulati | 95% CI | | | | | |
| | Estimate | SE | p-value | LB | UB | |
| Age | 2.60 | 0.15 | <.001 | 2.29 | 2.83 | |
| Age ² | -0.20 | 0.03 | <.001 | -0.26 | -0.15 | |
| Parent Ed. | -0.64 | 0.32 | .04 | -1.23 | -0.03 | |
| WASI | 1.38 | 0.08 | <.001 | 1.23 | 1.53 | |
| Post-Peak Analysis 95% C | | | | | | |
| Age Range | Estimate | SE | p-value | LB | UB | |
| 25-30 | -0.77 | 1.40 | 59 | -3.46 | 2.08 | |

Note. Parent Ed., parental education; WASI, WASI t-score; LB/UB, Lower and upper bound values of the blas-corrected 95% confidence interval (CI), respectively. Composite scores were multiplied by 100 and centered at age 18.

FABLE 3 Descriptive statistics by age group: mean (SD)

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FIGURE 1 Age differences in scores on composite variables: sensation seeking (top) and self-regulation (bottom) in the whole sample. Composite scores were multiplied by 100 and centered at age 10. Grey shading denotes a plateau/peak, defined as years of age for which the instantaneous rate of change (i.e. the estimated slope of the age curve) did not differ significantly from zero. Dashed lines indicate 95% confidence bands

but the rate at which self-regulation increased and the age at which it plateaued varied among these countries. In Jordan and India, selfregulation did not vary systematically with age (Jordan $b_{sge} = -0.67$, SE = 0.56, p = .23; India $b_{sge} = 0.72$, SE = 0.06, p = .20). In Sweden and Cyprus, on the other hand, self-regulation increased linearly with age without plateauing (Sweden $b_{sge} = 2.25$, SE = 0.45, p < .001; Cyprus $b_{sge} = 2.36$, SE = 0.15, p < .001). Thus, some of the observed differences between countries in the age pattern of self-regulation increased with age (e.g., in both China and Thailand, self-regulation increased and then plateaued, but the increase was relatively steeper in China), whereas other differences between countries reflected a distinctly different age-related pattern (i.e., a linear increase with no discernible plateau in Sweden) or no age-related pattern at all (i.e. in Jordan and India).

Last, we examined the age-related pattern in the development of sensation seeking and self-regulation within each country considered separately, using within-country standardized variables. Results for sensation seeking revealed a significant, inverted U-shaped curvilinear age pattern in 7 of the 11 countries: China, India, Italy, Kenya, the Philippines, Thailand and the United States. Sensation seeking increased linearly with age in Jordan (b = 1.27, SE = 0.57, p = .03). We found no evidence

that sensation seeking varied with age in Sweden (b = -0.21, SE = 0.58, p = .72), Colombia (b = -0.27, SE = 0.48, p = .57), or Cyprus (b = -0.32, SE = 0.55, p = .56). Detailed results of these analyses are described in Table S5. See Figure 2 (top) for a plot of significant age trends.

With respect to self-regulation, we found significant age-related increases in 9 of the 11 countries. In China, Italy, the Philippines, and the United States, self-regulation increased during adolescence and plateaued in early adulthood. Self-regulation increased linearly with age in Colombia (b = 2.45, SE = 0.46, p < .001), Cyprus (b = 2.00, SE = 0.76, p = .009), Kenya (b = 1.27, SE = 0.43, p = .003), Sweden (b = 2.82, SE = 0.51, p < .001), and Thailand (b = 2.91, SE = 0.59, p < .001). Self-regulation tended to increase linearly in Jordan (b = -0.97, SE = 0.58, p = .09), but we did not find age-related differences in India (b = 0.77, SE = 0.52, p = .14). Full results of these analyses are described in Table S6. See Figure 2 (bottom) for a plot of significant age trends.

4 | DISCUSSION

Overall, our findings indicate that the developmental patterns in sensation seeking and self-regulation observed previously in American and



FIGURE 2 Within-country standardized age differences in scores on composite variables: sensation seeking (top) and selfregulation (bottom). Composite scores were multiplied by 100 and centered at each country's mean at age 10. Countries in which there were no significant age trends are not shown

Western European samples are found in other parts of the world as well, in countries that vary considerably with respect to their cultural and economic contexts. Generally speaking, self-regulation develops linearly and gradually over the course of adolescence, reaching a plateau somewhere during the mid-20s, whereas reward seeking follows an inverted U-shaped pattern, increasing between preadolescence and late adolescence, peaking at around age 19, and then declining as individuals move into and through their 20s. Although there are minor variations in these patterns across countries, the similarities between the observed age trends are far more striking than the differences. When countries evinced age patterns that differed from the overall trend, the differences were more often in degree (e.g., in how sharply sensation seeking peaks in late adolescence, or the degree to which self-regulation improves over the course of adolescence), rather than in the shape of the age trend. Moreover, although the correlations between the three components of each composite are modest, as we expected them to be, all three indicators of sensation seeking follow a curvilinear age pattern with a peak in adolescence, whereas all three

indicators of self-regulation show a gradual increase between preadolescence and young adulthood.

Prior studies of age differences in sensation seeking and the processes presumed to underlie it, such as reward sensitivity, have disagreed as to whether the peak occurs in middle or in late adolescence (Shulman et al., 2016). The results of the present analyses indicate that discrepancies among studies in the exact age of the peak are probably the result of differences in samples and measures. Thus, although scores on the composite measure of sensation seeking in the sample as a whole peaked at age 19, the peak occurred somewhat earlier than this in some countries (e.g. Italy) and later in others (e.g. Kenya). Similarly, although the peak in the composite measure was observed at 19, sensation seeking as indexed by risky driving on the Stoplight game peaked earlier than this, whereas sensation seeking as indexed by approach behavior on the IGT peaked later. The important point, it seems to us, is that pretty much regardless of how or where it was measured in this large international sample, sensation seeking is higher during middle and late adolescence than before or after.
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Along similar lines, past research on self-regulation has not always been consistent with respect to the extent to which this capacity continues to grow after adolescence, with some studies indicating a midor late adolescent plateau (Andrews-Hanna, Mackiewicz Seghete, Claus, Ruzic, & Banich, 2011) and others pointing to continued improvement into the mid-20s (Shulman et al., 2016; Somerville, Hare, & Casey, 2011). The findings of the present study suggest that these discrepancies may also result from variations in samples and measures. Thus, although scores on the composite measure of self-regulation in the sample as a whole plateaued during the mid-20s, this pattern was observed in some countries (e.g. China), but not in others, where self-regulation continued to develop beyond this age (e.g. Colombia). As with sensation seeking, age trends in self-regulation also varied as a function of how it was measured. The young-adult plateau was most obvious with respect to impulse control as indexed by performance on the Tower of London task, whereas scores on the measure of self-reported planning continued to improve during the late 20s. Regardless of how it is measured, however, the development of self-

regulation clearly is not complete by the end of adolescence.

Despite the general pattern of consistency in findings across measures, a subset of countries did not evince the expected age patterns as measured by the sensation-seeking and self-regulation composites. The countries that did not display the inverted U-shaped pattern of sensation seeking - Jordan, Colombia, Cyprus and Sweden - differ with regard to culture, geography and economics, among other variables, so it is hard to speculate about a common factor that might lead all of these countries to depart from the expected trend. Although the two countries in which we did not observe increases in self-regulation with age (Jordan and India) both score relatively high in 'restraint' in ratings of countries along the 'Indulgence-Restraint' dimension (Hofstede et al., 2010), an examination of the mean self-regulation composite scores in these countries indicates that the absence of an age trend on this measure is probably not due to a ceiling effect (i.e. the scores were not so high as to preclude improvement with age). We have no ready explanation for this, and in the absence of obvious similarities among these countries in other respects, it would be imprudent to offer post hoc explanations of these findings. However, we do note that, although scores on the self-regulation composite did not change significantly with age in India, self-regulation as measured by the two behavioral tasks did show modest improvements with age (none of the self-regulation measures evinced age-related change in Jordan). Exploring specific country-level differences in developmental trajectories, as well as in mean levels of sensation seeking and self-regulation at different ages, will be important for future research.

Overall, the results of this study are consistent with portrayals of adolescence as a time of heightened sensation seeking in the face of still developing self-regulation, a combination that has been linked to the greater prevalence in risk taking during adolescence than before or after (Quinn & Harden, 2013; Steinberg, 2008). Given that actual rates of adolescents' risky behavior vary considerably around the world, however, it is clear that while certain aspects of psychological development in adolescence may be universal (and perhaps dictated by biology), their downstream effects are not. Although evolutionary models of adolescence are helpful in explaining why this stage of development is a period during which individuals are more willing to take risks – the argument is that the willingness to take risks at time of peak fertility allows juveniles to leave and mate outside the natal environment – these models do not explain why adolescent risk-taking manifests itself to different degrees and in different ways around the globe. The fact that this is the case can only mean that the broader context in which adolescents develop exerts a powerful impact on the extent to which young people engage in risky and health-compromising behavior. From a public health perspective, this is very good news, for it suggests that adolescent recklessness is not the inevitable byproduct of the period's neurobiology.

The principal aim of the present study was to examine two key tenets of the dual systems model: that sensation seeking peaks during adolescence and that self-regulation continues to mature over the same period of development. We believe that the results presented here provide strong support for this view, a conclusion that is consistent with that of a recent comprehensive review of the neuroscientific and psychological literatures (Shulman et al., 2016). Around the world, adolescence is a time when individuals are inclined to pursue exciting and novel experiences but have not yet fully developed the capacity to keep impulsive behavior in check.

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SUPPORTING INFORMATION

Additional Supporting Information may be found online in the supporting information tab for this article.

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