S277487

IN THE SUPREME COURT OF THE STATE OF CALIFORNIA

PEOPLE,

Plaintiff and Respondent,

v.

TONY HARDIN

Defendant and Petitioner.

Second Appellate District, Division 7, Case No. B315434
Los Angeles County Superior Court, Case No. A893110

APPLICATION OF NEUROSCIENCE, PSYCHOLOGY, AND JUVENILE JUSTICE SCHOLARS AND NONPROFITS TO FILE AMICUS CURIAE BRIEF IN SUPPORT OF PETITIONER; [PROPOSED] AMICUS CURIAE BRIEF

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APPLICATION FOR LEAVE TO FILE A BRIEF AS AMICI CURIAE SUPPORTING APPELLANT TONY HARDIN

Pursuant to Rule 8.520, subdivision (f), of the California Rules of Court, amici neuroscience, psychology, and juvenile justice scholars and nonprofits (hereafter, amici) respectfully request this Court's permission to file a brief as amici curiae in support of defendant and appellant Tony Hardin.

Amici are experts in the study of brain development, adolescent behavior, and juvenile justice, and their nonprofit membership organizations.[1] Courts, including the U.S. Supreme Court and state high courts, have drawn upon scientific literature in these fields to assess the constitutionality of imposing life-determinant sentences, such as capital punishment and life without the possibility of parole (LWOP), on adolescents.

Amici respectfully submit this Brief to highlight the scientific evidence regarding continued development of brain structure and function of persons aged 18-25, also known as late adolescents. Novel methods of brain and behavioral assessment and surging scholarly interest in late adolescent development have prompted tremendous advances in understanding how

[1] Counsel for amici authored this Brief in full. No person or entity, including counsel or amici, made a monetary contribution intended to fund the preparation or submission of the Brief. Research cited in this Brief includes data from studies conducted using the scientific method, which is subject to critical review by outside experts. For identification purposes only, the identities, titles, and affiliations of scholar amici are detailed in the Appendix. Organizational amici include Juvenile Law Center, the American Academy of Pediatric Neuropsychology, the Pacific Juvenile Defender Center, and The Sentencing Project.

neuroscience and psychology relate to juvenile justice. This relatively recent but robust body of empirical evidence shows that personality, behavior, and the brain itself all continue to change markedly through late adolescence. Due to this state of growth and flux, late adolescents are more likely to engage in irrational, risky, and impulsive behavior by virtue of their comparatively immature brains and vulnerability to external influences. Generally then, as their brains develop and their capacity for reasoned decision-making improves, late adolescents typically grow out of these behaviors as they age. As both the Legislature and the Court of Appeal recognized, these findings have profound implications for late adolescent decision-making and self-control, as well as how courts should respond to misconduct by late adolescents.

In recent years, amici have filed amicus briefs in state high court proceedings regarding the application of life without parole sentences to late adolescents, to ensure that their decision-making is informed by this scientific evidence. (See *People v. Parks* (Mich. 2022) 987 N.W.2d 161; *People v. Poole* (Mich. 2022) 977 N.W.2d 530; *People v. Mattis*, Case No. SJC-11693 (Mass.) [awaiting decision]; *People v. Robinson*, Case No. SJC-09265 (Mass.) [same].) Amici have the same interest here in ensuring that this evidence is available to the Court as it evaluates whether Penal Code, section 3051(h)'s exclusion of certain late adolescents from parole suitability hearings violates equal protection.

For the foregoing reasons, amici respectfully request that the Court grant their application. The proposed brief is attached.

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BRIEF OF AMICI NEUROSCIENCE, PSYCHOLOGY, AND JUVENILE JUSTICE SCHOLARS AND NONPROFITS

INTRODUCTION

Under well-established California law, anyone sentenced to life without the possibility of parole (LWOP) for any offenses committed before their 18th birthday must eventually receive a parole hearing. That constitutional and statutory directive arose due to scientific findings that prompted courts to conclude that, irrespective of offense or issued sentence, the still-developing brains and personalities of adolescents under the age of 18 render them less culpable and more capable of reform. In recent years, a wealth of scientific research has confirmed that persons in "late adolescence"—ages 18-25—share these same mitigating traits. However, for late adolescents sentenced to LWOP, current state law overlooks their reduced culpability and enhanced prospects for reform by depriving them of any parole hearing at all.

As the Court of Appeal recognized, California's current approach—depriving certain late adolescents of the chance to demonstrate reduced culpability and strong capacity for change—runs counter to the currently established yet continuously growing body of neuroscientific and psychological studies. Collectively, these studies conclusively prove that late adolescents, like persons in earlier phases of adolescence, and irrespective of offense or issued sentence, possess still-developing brains and personalities that render them less culpable and more capable of reform.

Pursuant to these findings, the Legislature expanded the definition of "youthful offender" to include all late adolescents. (Pen. Code, § 3051.)[2] Section 3051 currently instructs the Board of Parole Hearings (the "Board") to offer parole hearings for "youthful offenders" during which time the Board "shall give great weight to the diminished culpability of youth as compared to adults, the hallmark features of youth, and any subsequent growth and increased maturity." (§ 4801, subd. (c).) At the same time, however, even as the Legislature redefined "youthful offender" to encompass *all* late adolescents, section 3051(h) excludes late adolescents sentenced to LWOP from this ameliorative program.

In amending section 3051's "youthful offender" definition, the Legislature sought "to account for neuroscience research that the human brain—especially those portions responsible for judgment and decision-making—continues to develop" through late adolescence. (*People v. Edwards* (2019) 34 Cal.App.5th 183, 198.) "[R]elying on science," the Legislature expressly "recognized that these mitigating attributes 'are found in young adults up to age 25' and 'that the ordinary process of neurological and cognitive development continues for several years past age 18.' " (*People v. Jackson* (2021) 279 Cal.Rptr.3d 396, 406–07 (conc. stmt. of Liu, J.).) Thus, "the intent of the Legislature [was] to create a process by which growth and maturity of youthful offenders [including late adolescents] can be assessed and a meaningful opportunity for release established." (§ 3051, as amended by Stats. 2013, ch. 312, § 1.)

[2] All undesignated statutory references are to the Penal Code.

As the Court of Appeal recognized, section 3051's "intended purpose" is to "permit[] a determination whether a person who committed a serious or violent crime between the age of 18 and 25 has sufficiently matured and outgrown the youthful impulses that led to the commission of the offense." (*People v. Hardin* (2002) 84 Cal.App.5th 273, 287.) In light of this intent, amici submit that the categorical exclusion of certain late adolescents from future parole hearings thwarts the Legislature's express intent to align late adolescent parole eligibility with prevailing neuroscience and "to create a process by which [mitigating attributes] can be assessed and a meaningful opportunity for release established" for all "youthful offenders." (§ 3051.)

Crucially, the Legislature's failure to make parole hearings available to all late adolescents, regardless of offense or issued sentence, is irrational and unsupported by science. As detailed in this Brief, the developmental processes that make all late adolescents more vulnerable to risk-taking, negative peer influence, and criminality, as well as more receptive to lasting reform once mature, do ***not*** depend on their offense or sentence. (*People v. Montelongo* (2021), 274 Cal.Rptr.3d 267, 289 (conc. stmt. of Liu, J.) (*Montelongo*) [section 3051(h) stands in "tension" with "the high court's clear statement that the mitigating attributes of youth are not 'crime-specific' [citation] and our Legislature's recognition that those attributes are found in young adults up to age 25"].) From the perspective of brain science, then, late adolescents like Tony Hardin who received LWOP sentences are similarly situated to life term parole-eligible late adolescents and

other late adolescents: none are beyond section 3051's rehabilitative reach.

Given this, section 3051(h)'s line-drawing—allowing some late adolescents access to parole and denying others that same opportunity—relies on an unsound premise repudiated by science. The provision thwarts the Legislature's overriding purpose in enacting and amending section 3051 to effectively codify the prevailing scientific consensus and guarantee parole eligibility for all "youthful offenders," in light of the ongoing maturation and diminished culpability of late adolescents. Accordingly, amici submit that section 3051(h) is irrational.

The judgment of the Court of Appeal should be affirmed.

ARGUMENT

I. High Court Precedent Shields Adolescents from LWOP Given the Mitigating Attributes of Adolesence.

The U.S. Supreme Court and this Court have repeatedly recognized that their respective Constitutions protect adolescents under 18 from " 'the most severe punishments,' " including LWOP. (See, e.g., *Roper v. Simmons* (2005) 543 U.S. 551 (*Roper*) [capital punishment unconstitutional for persons under 18]; *Graham v. Florida* (2010) 560 U.S. 48 (*Graham*) [LWOP unconstitutional for person under 18 for non-homicide offenses]; *Miller v. Alabama* (2012) 567 U.S. 460 (*Miller*) [mandatory LWOP unconstitutional for persons under 18 for any offense]; *Montgomery v. Louisiana* (2016) 577 U.S. 190 (*Montgomery*) [applying *Miller* retroactively]; *People v. Caballero* (2012) 55 Cal.4th 262, 268 (*Caballero*) [barring sentences for adolescents that are the "functional equivalent" to

LWOP].) In reaching these holdings, both courts relied on, among other things, then-available scientific literature (since affirmed and supplemented) regarding adolescent immaturity and ongoing brain development.[3] (See *Graham,* at p. 68 [emphasizing "fundamental differences" in the brains and behavior of adolescents]; *Miller*, 567 U.S. at p. 472 & fn.5 ["science and social science supporting *Roper*'s and *Graham*'s conclusions have become even stronger"]; *People v. Franklin* (2016) 63 Cal.4th 261, 273 (Franklin) [finding *Miller*'s mitigating attributes "increasingly substantiated through science"].)

The *Miller* Court specifically called attention to the mitigating attributes of adolescence, undergirded by social science and neuroscience, that compel these heightened constitutional guardrails. ***First***, adolescents exhibit a " 'lack of maturity and an underdeveloped sense of responsibility,' " leading to recklessness, impulsivity, and heedless risk-taking. [Citation.]." (*Miller*, 567

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[3] *See, e.g.*, Arnett, *Reckless Behavior in Adolescence: A Developmental Perspective* (1992) 12 Dev. Rev. 339 (hereafter *Reckless Behavior*) (cited in *Roper*); Steinberg & Scott, *Less Guilty by Reason of Adolescence: Developmental Immaturity, Diminished Responsibility, and the Juvenile Death Penalty* (2003) 58 Am. Psychol. 1014 (cited in *Roper*); Erikson, *Identity: Youth and Crisis* (1968) (cited in *Roper*); Rosso et al., *Cognitive and Emotional Components of Frontal Lobe Functioning in Childhood and Adolescence* (2004) 1021 Annals. N.Y. Acad. Sci. 360-61 (submitted in *Graham*); Bunge et al., *Immature Frontal Lobe Contributions to Cognitive Control in Children: Evidence from fMRI* (2002) 33 Neuron. 301 (submitted in *Graham*); Gogtay et al., *Dynamic Mapping of Human Cortical Development During Childhood Through Early Adulthood* (2004) 101 Proc. Nat'l Acad. Sci. 8174 (submitted in *Graham*).

U.S. at p. 471.) ***Second***, adolescents " 'are more vulnerable . . . to negative influences and outside pressures,' including from their family and peers; they have limited 'contro[l] over their own environment' and lack the ability to extricate themselves from horrific, crime-producing settings. [Citation.]" (*Ibid.*) ***Third***, during adolescence, personality "is not as 'well formed' as an adult's; his traits are 'less fixed' and his actions less likely to be 'evidence of irretrievabl[e] deprav[ity].' " (*Ibid.*)

Crucially, as the U.S. Supreme Court clarified in *Miller*, the "distinctive (and transitory) mental traits and environmental vulnerabilities" of adolescence "are evident in the same way, and to the same degree" when an adolescent commits a serious crime, regardless of their offense or sentence. (*Miller*, 567 U.S. 460, 473; see *id.* at p. 473 [the mitigating attributes of adolescence are not "crime-specific"]; see *Montelongo*, 274 Cal.Rptr.3d at p. 289 (conc. stmt. of Liu, J), quoting *Montelongo*, 274 Cal.Rptr.3d at p. 284 (conc. opn. of Segal, J.).) In other words, the high court clearly held that these mitigating attributes apply to adolescents as a class—as do the constitutional safeguards that accompany them. (*People v. Gutierrez* (2014) 58 Cal.4th 1354, 1395 (*Gutierrez*) (conc. opn. of Liu, J.) ["*Miller,* in clear language, announced a principle that applies to all juveniles."].)

II. *Miller*'s Mitigating Attributes of Adolescence Apply with Compelling Force to All Late Adolescents.

In the wake of the U.S. Supreme Court's findings in *Roper* (2005), *Graham* (2010), *Miller* (2012), and *Montgomery* (2016) concerning constitutionally-significant attributes of adolescence, pioneering neuroscientific and psychology research has continued,

with a particular focus on the development of late adolescents. These peer-reviewed studies, many authored by amici, establish conclusively that "the ordinary process of neurological and cognitive development continues for several years past age 18." (*Montelongo*, 274 Cal.Rptr.3d at p. 290 (conc. stmt. of Liu, J.).)

Indeed, the scientific consensus today widely recognizes late adolescence as marked by profound brain and psychological maturation in areas governing emotional arousal and self-control.[4] Late adolescence operates as a key phase of development sharing the constitutionally-significant mitigating attributes of earlier periods of adolescence, including "immaturity, impetuosity, susceptibility to peer pressure or the negative influence of older individuals, and the failure to appreciate risks and consequences." (Assem. Com. on Public Safety, Bill Analysis, Sen. Bill No. 260 (2013–2014 Reg. Sess.), as amended June 27, 2013.) So just as adolescents under 18 may act impulsively and without regard for

[4] *See, e.g.*, Steinberg & Icenogle, *Using Developmental Science to Distinguish Adolescents and Adults Under the Law* (2019) 1 Ann. Rev. Dev. Psychol. 21, 34 (hereafter Steinberg & Icenogle); National Academy of Science, Engineering, and Medicine, *The Promise of Adolescence: Realizing Opportunity for All Youth* (2019) 22 (Washington, DC: The National Academies Press) ("young adulthood" includes ages 18 to 25); Sawyer et al., *The Age of Adolescence* (2018) 2 Lancet Child Adolesc. Health 223–28 (hereafter Sawyer) (characterizing 10 to 24 years as best corresponding to popular understandings of adolescence); Dosenbach et al., *Prediction of Individual Brain Maturity Using fMRI* (2010) 329 Science 1360 (defining "young adults" as ages 18 to 30) (hereafter Dosenbach); Arain et al., *Maturation of the Adolescent Brain* (2013) 9 Neuropsychiatric Disease and Treatment 450 (herafter Arain) (describing "adolescence" as "ages 10–24 years").

consequences due to ongoing brain development pivotal to long-term planning, reasoned judgment under stress, and future orientation, so too may late adolescents. (See *Montelongo*, 274 Cal.Rptr.3d at p. 286 (conc. opn. of Segal, J.) ["certain areas of the brain, particularly those affecting judgment and decision-making, do not develop until the early-to-mid-20s"].)

These studies also demonstrate that "what the high court has said about juveniles also applies to [late adolescents]" and that "such offenders 'who commit even heinous crimes are capable of change.' " (*Montelongo*, 274 Cal.Rptr.3d at p.290 (conc. stmt. of Liu, J.) [quoting *Montgomery v. Louisiana* (2016) 577 U.S. 190, 212].) Contrary to the Attorney General's position that only adolescents under 18 sentenced to LWOP are "most deserving" of parole because their "brains were still developing and [their] judgment had not yet matured," late adolescence does not simply involve limited changes in brain structure and function, but rather "a series of developmental cascades" of neurological transformations across multiple brain networks that, in turn, empower all late adolescents to transition towards rational control of behavioral impulses observed in neurocognitive adulthood.[5] As

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[5] *Reckless Behavior*, *supra*, 12 Dev. Rev. 339; Jaworska & MacQueen, *Adolescence as a Unique Developmental Period* (2015) 40 J. of Psychiatry & Neuroscience 291 (hereafter Jaworska); Teipel, *Developmental Tasks and Attributes of Late Adolescence/Young Adulthood*, State Adolescent Health Resource Center <http://www.amchp.org/programsandtopics/AdolescentHealth/projects/Documents/SAHRC%20AYADevelopment%20LateAdolescentYoungAdulthood.pdf> (as of Dec. 20, 2021) (hereafter Teipel); Masten & Cicchetti, *Developmental Cascades* (2010) 22 Dev.

such, the scientific evidence detailed below regarding brain maturation *during* and *after* a person's teenage years confirms that the mitigating attributes of adolescence apply broadly to all late adolescents as a class.[6]

A. Fundamental Changes in Brain Development Occur During Adolescence and Continue Through Late Adolescence.

1. The brain has exceptional plasticity through late adolescence.

The human brain has capacity for change (or "plasticity") throughout life, and it shows remarkable potential for learning and change through late adolescence.[7] Influenced by a person's genetics, cognitive development, and upbringing (including childhood trauma and chronic stress, *see* Section II.C, *infra*), brain plasticity can radically reshape neural pathways.

Psychopathol. 491–95; Casey et al., *Development of the Emotional Brain* (2019) 693 Neuroscience Letters 29–34.

[6] It is also noteworthy that late adolescent brain development emerges in tandem with the unique demands that late adolescents face (e.g., physical, sexual, social, and psychological changes) as they prepare to transition to neurocognitive adulthood. (Sawyer, *supra*, 2 Lancet Child Adolesc. Health 223–28.) Late adolescence also often operates as an important sociocultural transition phase, as many individuals lose certain family and academic structures and access to supportive family- and child-centered health and social services. (*Ibid.*; *see also* Arnett, *Emerging Adulthood: A Theory of Development From the Late Teens Through the Twenties* (2000) 55 Am. Psychologist 469; Jaworska, 40 J. of Psychiatry & Neuroscience 291; Teipel, *supra*, State Adolescent Health Resource Center.)

[7] Bavelier et al., *Removing Brakes on Adult Brain Plasticity: From Molecular to Behavioral Interventions* (2010) 30 J. Neurosci. 14964–71.

During adolescence and late adolescence, the brain undergoes substantial synaptic pruning, through which unused excitatory synapses (connections between neurons) are eliminated to increase efficiency in communication among the remaining neuronal connections, which supports learning, cognition, and reasoned decision-making.[8] A "hallmark of the brain transformations of adolescence," synaptic pruning during adolescence—continuing through late adolescence—removes approximately half of the synaptic connections in certain brain regions.[9] This marked reduction in synapses corresponds with "the 'rewiring' of brain connections into adult-typical patterns."[10]

[8] *See* Selemon, *A Role for Synaptic Plasticity in the Adolescent Development of Executive Function* (2013) 3 Translational Psychiatry 1 ("Synaptic pruning of excitatory contacts is the signature morphologic event of late brain maturation during adolescence"); Casey et al., *Structural and Functional Brain Development and its Relation to Cognitive Development* (2000) 54 Biological Psychol. 245–46 (hereafter *Structural and Functional Brain Development*) (reviewing studies examining prefrontal cortical activity in adolescents and concluding that increased cognitive capacity coincides with a loss of some synapses and strengthening of remaining synapses).

[9] Spear, *Adolescent Neurodevelopment* (2013) 52 J Adolescent Health 7–13 (2013).

[10] *Id*.

Adolescent and late adolescent brains simultaneously undergo gradual myelination, in which axons (the parts of nerve cells along which nerve impulses are conducted to other cells) become insulated with fatty, insulative tissue known as myelin. Myelination increases the transmission speed of electrical signals. Myelination thus enables the remaining connected neurons to communicate with greater speed and efficiency, even between distant regions of the brain.[11] Through at least late adolescence, these developing pathways facilitate greater dialogue among different brain systems that process cognitive, emotional, and social information important for self-control. As shown in Figure 1, these processes together prime the brain for learning and change during late adolescence, especially in pathways involving

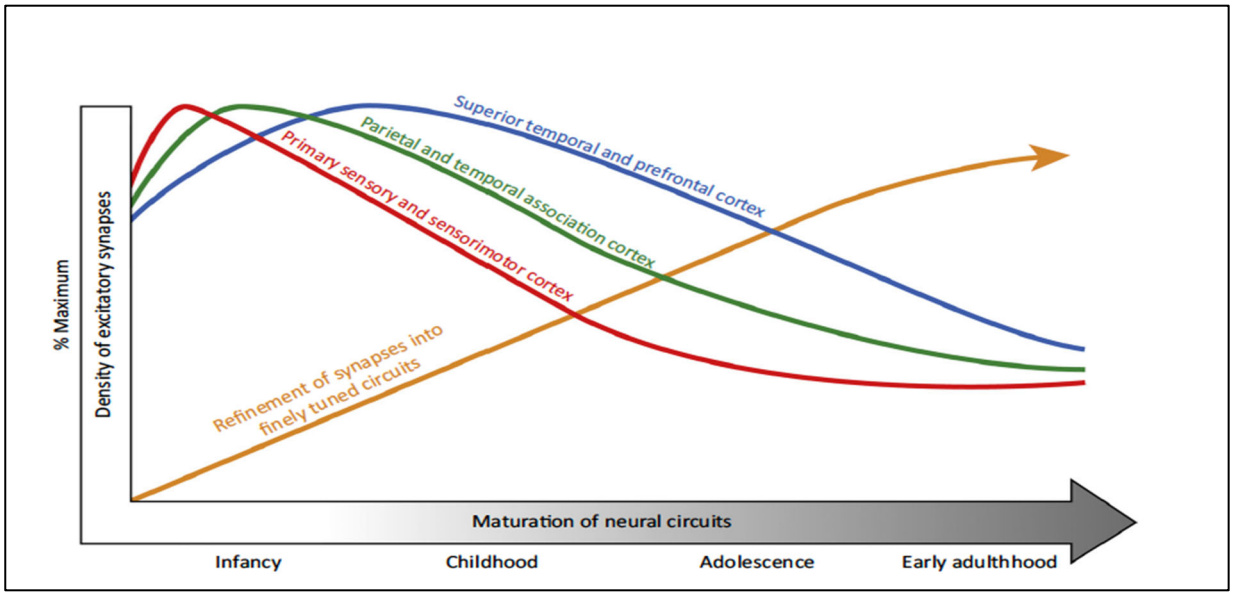

Figure 1 — Density and maturation of various neutral circuitry through early adulthood. Forsyth & Lewis, *Mapping the Consequences of Impaired Synaptic Plasticity in Schizophrenia through Development: An Integrative Model for Diverse Clinical Features* (2017) 21 Trends in Cogn. Sci. 765.

[11] *Id.*

the prefrontal cortex that supports decision-making and self-control.

2. Brain imaging reveals key neurological development beyond age 17.

The brain shows dynamic changes in structure and function throughout late adolescence. Imaging tools like MRI provide researchers with the ability to see structural changes in tissue (gray and white matter) related to processes at the level of the synapse and myelin sheath and functional changes related to neuronal activity. This increased visibility into brain development reveals significant changes in gray and white matter that extend through and beyond late adolescence. Figure 2 below illustrates findings across key brain metrics related to changes in cognitive abilities (including decision-making, self-control, and social and emotional behavior):

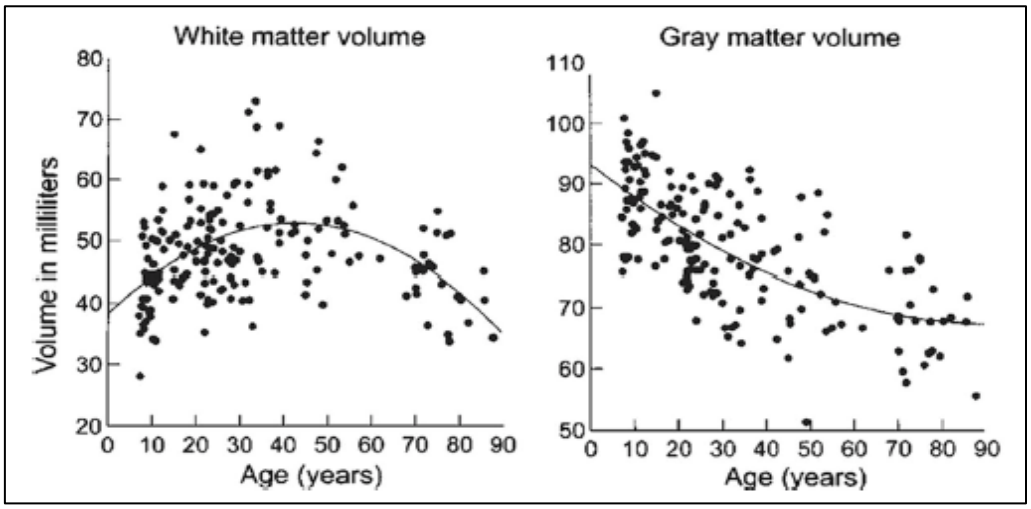

Figure 2 — Changes in white and gray matter volume throughout life. Sowell et al., *Mapping Cortical Change Across the Human Life Span* (2003) 6 Nature Neuroscience 314.

- **<u>Gray matter development</u>**: Thinning of cortical gray matter (the regions containing most of the brain's neuronal cells, and correlated with improved decision-making, self-control, and other key milestones) continues through an individual's late twenties—and is associated with continued synaptic pruning during late adolescence.[12] Gray matter changes also demonstrate disparate regional development as shown in Figure 3 below. The prefrontal cortex that modulates cognitive control and decision-making shows a dramatic 17 percent reduction in gray matter volume between ages 6 to 26. By comparison, over the same period, subcortical regions implicated in emotional and motivation processing, the amygdala and ventral striatum, exhibit a 7 percent reduction.[13] These results track a developmental mismatch during late adolescence between (i) the less developed regions controlling foresight, planning, self-

[12] Schnack et al., *Changes in Thickness and Surface Area of The Human Cortex and Their Relationship with Intelligence* (2015) 25 Cerebral Cortex 1608; Fjell et al., *Development and Aging of Cortical Thickness Correspond to Genetic Organization Patterns* (2015) 112 Proc. Nat'l Acad. Sci. 15462.

[13] Mills et al., *The Developmental Mismatch in Structural Brain Maturation During Adolescence* (2014) 36 Dev. Neuroscience 147–60 (hereafter Mills).

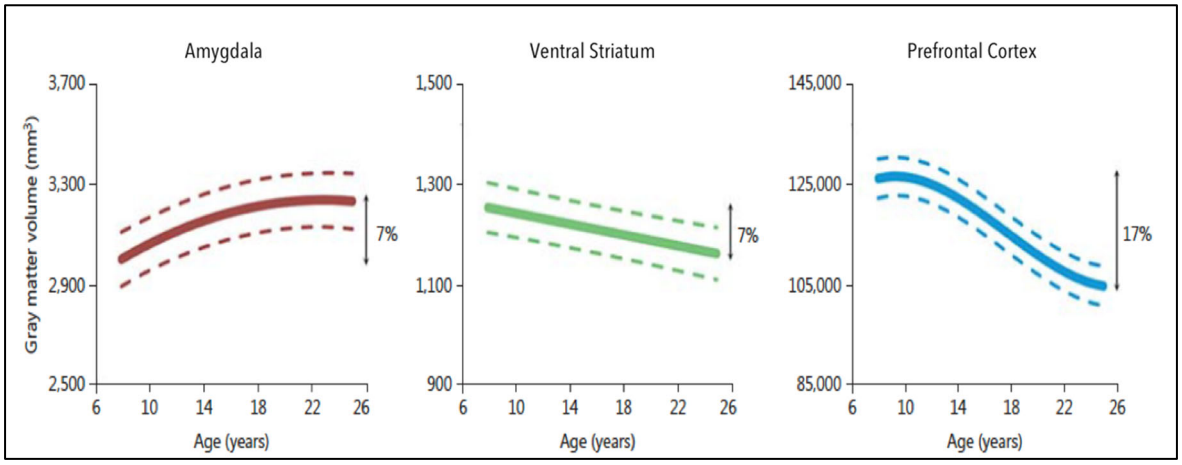

Figure 3 — Gray matter volume in amygdala, ventral striatum, and prefrontal cortex through late adolescence. Mills, *supra*, 6 Dev. Neuroscience 153.

control, and risk-aversion, and (ii) the more developed and dominant regions implicated in states of emotional arousal.

- **White matter development**: White matter increases well beyond age 18, throughout late adolescence, and is thought to reflect heightened brain processing, impulse control, and reasoned decision-making.[14] Associated with gradual myelination and the brain's stimuli processing speed, the incomplete development of these connections through late adolescence has been implicated in diminished self-control and increased impulsive and risky behavior.[15] During late adolescence, white matter connections between the prefrontal cortex and subcortical regions multiply and

[14] Lebel et al., *A Review of Diffusion MRI of Typical White Matter Development from Early Childhood to Young Adulthood* (2019) 32 NMR Biomedicine E3778.

[15] Casey, *Beyond Simple Models of Self-Control to Circuit-Based Accounts of Adolescent Behavior* (2015) 66 Ann. Rev. of Psychol. 1 (hereafter *Beyond Simple Models*).

mature, contributing to improved self-control needed for neurocognitive adulthood.[16]

- **Functional brain development**: Functional brain development is assessed during rest or during a task. Resting-state functional MRI ("fMRI") measures correlations in spontaneous activity between brain regions over time when resting and is referred to as functional connectivity. Task-based fMRI looks at changes in brain activity in response to stimuli or performance of a task. Changes in functional connectivity during rest show continued significant changes well beyond 18 years of age and through late adolescence as demonstrated in Figure 4.[17] Through adolescence, including late adolescence, a transition occurs from a state featuring more local connections to one that exhibits strengthened distal connections. Both functional connectivity and task-based prefrontal activity appears less mature under conditions of emotional arousal (*e.g.*, anticipation of a threat) relative to non-arousing ones. In these conditions, teens and late adolescents show similar increases in impulsivity and risk

[16] Simmonds et al., *Developmental Stages and Sex Differences of White Matter and Behavioral Development Through Adolescence: A Longitudinal Diffusion Tensor Imaging (DTI) Study* (2014) 92 Neuroimage 356.
[17] Dosenbach, *supra*, 329 Science 1358–61.

preferences, suggesting widespread susceptibility to situational diminished capacity for all late adolescents.[18]

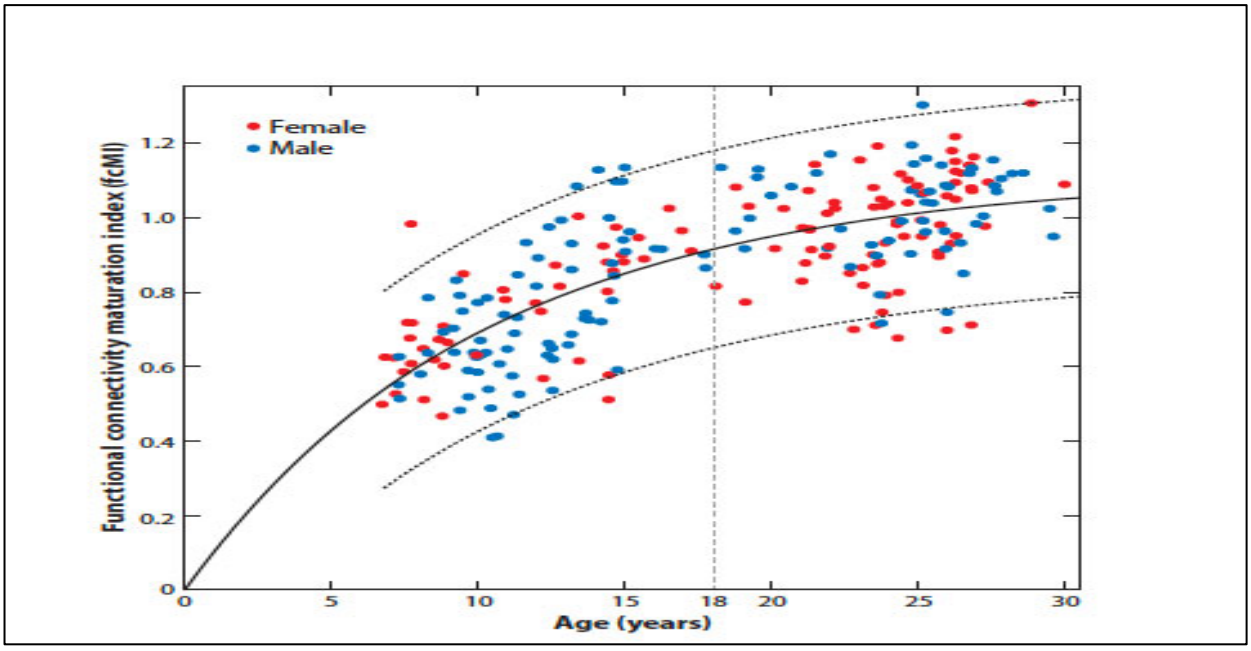

Figure 4 — Functional connectivity maturation in the brain through late adolescence and up to 30. Dosenbach, *supra*, 329 Science 1359.

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Both individually and collectively, recent studies have shown that late adolescence is a period of substantial ongoing maturation and development in the regions and circuits of the brain that process information associated with rewards and emotional reactivity, especially in those regions such as the prefrontal cortex important for decision-making and impulse

[18] Rudolph et al., *At Risk of Being Risky: The Relationship Between 'Brain Age' Under Emotional States and Risk Preference* (2017) 24 Dev. Cogn. Neurosci. 93–106 (hereafter Rudolph); Cohen et al., *When Is an Adolescent an Adult? Assessing Cognitive Control in Emotional and Nonemotional Contexts* (2016) 27 Psychol. Sci. 549–62 (hereafter Cohen). Kinscherff et al., *White Paper on the Science of Late Adolescence A Guide for Judges, Attorneys, and Policy Makers* (2022), MGH Center for Law, Brain & Behavior, at 2.

control.[19] As the brain matures, particularly through late adolescence, changes in subcortical and cortical pathways are associated with improved cognitive capacity in social and emotional situations and substantially reduce late adolescents' propensity to engage in reckless behaviors.[20] So while the transformations leave all late adolescents particularly vulnerable to certain forms of transient mistakes and misconduct, those processes do not freeze them in a state of late adolescence. Rather, their brains continue to develop into adulthood, at which point they are more mature, more in control, and substantially less likely to engage in risky and impulsive behavior.[21]

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19 *See* Somerville, *Searching for Signatures of Brain Maturity: What Are We Searching For?* (2016) 92 Neuron. 1166–67 (hereafter Somerville) (signs of brain maturity, including structural development and connectivity patterns, continue to change dramatically through late adolescence, such that the "age of 18 as a cut-point for comparison between 'adolescents' and 'adults' . . . could obscure or even mask continued developmental change"); *see also* Cohen, *supra*, 27 Psychol. Sci. 549–62; Braams et al., *Longitudinal Changes in Adolescent Risk-Taking: A Comprehensive Study of Neural Responses to Rewards, Pubertal Development, and Risk-Taking Behavior* (2015) 35 J. Neuroscience 7226 (hereafter Braams); Insel et al., *Development of Corticostriatal Connectivity Constrains Goal-Directed Behavior During Adolescence* (2017) 8 Nat'l Commun. 1605.

[20] Cohen, *supra*, 27 Psychol. Sci. 549–62; Rudolph, *supra*, 24 Dev. Cogn. Neurosci. 93–106.

[21] *See* Hawes et al., *The Developmental Course of Psychopathic Features: Investigating Stability, Change, and Long-Term Outcomes* (2018) 77 J. Research in Personality 83–89 (hereafter Hawes).

3. The brain undergoes dynamic and hierarchical development rendering late adolescents uniquely vulnerable to maladaptive behavior.

Brain development is a dynamic and hierarchical process that occurs throughout life, and especially during the extended period of adolescence. Recent scientific findings indicate that, due to the timing of certain brain development processes, late adolescents are universally more susceptible to engaging in risky and impulsive behavior, and that their proclivity for such behavior generally recedes upon reaching neurocognitive adulthood.

Brain systems and the connections between them undergo refinement with age and experience. The timing of these changes, however, varies for different brain regions and networks. Subcortical regions including the ventral striatum and amygdala, which are important in reward and emotional learning and processing, show earlier structural and functional development than cortical regions.[22] By contrast, the prefrontal cortex, which guides self-control and complex decision-making, continues to mature throughout late adolescence. This extended window of prefrontal maturation parallels the prolonged social, emotional, and cognitive development that marks late adolescence.[23] Because the prefrontal cortex is more developed during late adolescence than earlier stages of adolescence, late adolescents have somewhat better cognitive control and decision-making skills than they did

[22] Mills, *supra*, 36 Dev. Neuroscience 147–60; Braams, *supra*, 35 J. Neuroscience 7226.

[23] Steinberg & Icenogle, *supra*, 1 Ann. Rev. Dev. Psychol. 21, 21.

when they were younger. However, because the brain's motivational and emotional systems are hyper-responsive through late adolescence, late adolescents tend to be more vulnerable than full adults to lapses in self-control or impulsive decision-making—especially when in emotionally heated situations,[24] even if they otherwise show mature cognitive appraisal of emotional inputs.[25]

By the end of late adolescence, the brain's development exhibits a crucial shift. Where the younger brain predominantly relies on emotional, or limbic circuitry, this period facilitates the transition to a neurocognitively adult brain that relies more on the cognitive control, or prefrontal circuitry.[26] While both brain systems play important roles in decision-making, limbic circuitry dominant in adolescence governs short-term reward/pleasure (through the ventral striatum and orbitofrontal cortex)[27] and emotional arousal (through the amygdala, hippocampus, and ventromedial prefrontal cortex).[28] By contrast, the prefrontal

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[24] Cohen, *supra*, 27 Psychol. Sci. 549–62.

[25] Silvers et al., *VlPFC-vmPFC-amygdala Interactions Underlie Age Related Differences in Cognitive Regulation of Emotion* (2017) 27 Cerebral Cortex 3502–14.

[26] *Beyond Simple Models*, *supra*, 66 Ann. Rev. of Psychol. 295-319; *see also* Cohen, *supra*, 27 Psychol. Sci. 549–62; *Structural and Functional Brain Development*, *supra*, 54 Biological Psychol. 245–46.

[27] Galván et al., *Earlier Development of the Accumbens Relative to Orbitofrontal Cortex Might Underlie Risk-Taking Behavior in Adolescents* (2006) 26 J. Neurosci. 6885–92.

[28] Casey et al., *Healthy Development as a Human Right: Insights from Developmental Neuroscience* (2020) 16 Ann. Rev. Law Soc. Sci. 203–22 (hereafter *Healthy Development*); Somerville, *supra*, 92 Neuron. 1164–67.

circuitry (lateral prefrontal cortex and posterior parietal cortex) dominant in adulthood regulates cognitive control responses such as reasoning, attention, planning, and memory retrieval. When fully developed, this brain system facilitates late adolescents' ability to efficiently engage in complex decision-making by weighing alternative choices and actions based on future objectives and consequences.

Prior to this transition, all late adolescents remain uniquely vulnerable to impulsive and risky behavior and decision-making because their more developed emotional circuitry causes outsized receptiveness to short-term rewards and adverse overreaction to threats. For persons in adolescence and late adolescence, dramatic changes are believed to occur in the prevalence and distribution of dopamine receptors across the brain.[29] These changes favor fleeting rewards and pleasure and correlate with a spike in risk-taking and peer-influenced behaviors. Additionally, the cognitive control system begins to develop in infancy and continues through at least late adolescence through a slow process that requires multiple systemic changes, and by adulthood better moderates such impulses.[30]

When faced with acute stress or emotional arousal, late adolescents' supercharged threat and stress response, as well as their eagerness for short-term rewards, are more likely to culminate in poor decision-making, weak impulse control, and

[29] Kinscherff et al., *supra* note 18, at 2; Braams, supra, 35 J. Neuroscience 7226 (measuring changes to dopamine receptors in animals);

[30] Arain, *supra*, 9 Neuropsychiatric Disease and Treatment 451.

limited regard for future consequences. Thus, for late adolescents, the conflicting interactions within and between the more developed limbic system and the relatively less developed prefrontal systems generate a heightened propensity to engage in maladaptive acts including irresponsible or criminal conduct.[31]

As brain imaging research suggests, individuals' ability to engage in mature decision-making through effective impulse control, risk avoidance, and coordination of emotion and cognition is not fully developed until after late adolescence.[32] After that point, the brain systems are more evenly developed, such that the systems and the neural pathways linking them can interact to enable suitable regulation of perceived incentives, threats, and consequences. This understanding from modern neuroscience offers a compelling explanation not only as to why all late

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[31] *See* Dreyfuss et al., *Teens Impulsively React rather than Retreat from Threat* (2014) 36 Dev. Neurosci. 225-26; Arain, *supra*, 9 Neuropsychiatric Disease and Treatment 453–55; Tyler, *Understanding the Adolescent Brain and Legal Culpability* (2015) American Bar Association <https://www.americanbar.org/groups/public_interest/child_law/resources/child_law_practiceonline/child_law_practice/vol-34/august-2015/understanding-the-adolescent-brain-and-legal-culpability/> (accessed January 17, 2022).

[32] Icenogle et al., *Adolescents' Cognitive Capacity Reaches Adult Levels Prior to Their Psychosocial Maturity: Evidence for a "Maturity Gap" in a Multinational, Cross-Sectional Sample* (2019) 43 Law Hum. Behav. 69–85; Hawes et al., *Modulation of Reward-Related Neural Activation on Sensation Seeking Across Development* (2017) 146 NeuroImage 763-771 (from the ages of 17 to 25 heightened reward-related reactivity in the brain was linked to increased sensation seeking); Braams, *supra*, 35 J. Neuroscience 7231 (finding neural responses activity in the context of risk-taking does not stabilize until past age 25).

adolescents are vulnerable to engaging in risky, irresponsible, and illicit behaviors, but also as to why their proclivity for such behaviors recedes upon reaching neurocognitive adulthood.[33]

4. Brain imaging shows late adolescent brains, especially under emotional arousal, resemble brains earlier in adolescence.

Neuroscientists have discerned age brackets for which brain imaging data indicates greater neurological similarities than differences, notwithstanding marginal differences in physical or neurocognitive ages. For example, although it is easy to distinguish between brain images of young adolescents compared to adults, it is exceedingly difficult to differentiate the brain images of adolescents and late adolescents.[34] This is due to strong similarities in brain immaturity as well as changes in functional connectivity between brain systems that prevail throughout this developmental period.[35] Other studies demonstrate that late adolescents not only exhibit the highest risk preferences among all age groups, but their brain images also reveal indistinguishable levels of underdeveloped functional connections, especially under emotional arousal (including stressful states in which serious crimes such as homicide may be committed).[36]

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[33] Casey et al., *Making the Sentencing Case: Psychological and Neuroscientific Evidence for Expanding the Age of Youthful Offenders* (2022) 5 Ann. Rev. of Criminology 7.1.
[34] Cohen, *supra*, 27 Psychol. Sci. 549–62.
[35] Cohen, *supra*, 27 Psychol. Sci. 549–62; Dosenbach, *supra*, 329 Science 1358–61.
[36] Rudolph, *supra*, 24 Dev. Cogn. Neurosci. 93–106; Cohen, *supra*, 27 Psychol. Sci. 549–62.

These findings suggest that in emotionally-charged situations the late-adolescent brain generally manifests as less mature than in calm, controlled environments, and that this immaturity is linked to riskiness.[37] Together, the neuroscientific evidence demonstrates that brain function and cognitive capacity vary as a function of emotional and social contexts and that full adult capacity in these contexts is not generally observed until after late adolescence—even though late adolescents may appear, from external appearances, to be fully mature.

B. Psychological Capacity Matures with Continued Brain Development Through Late Adolescence.

The brain's continued development through late adolescence is intertwined with changes in psychological and cognitive abilities, as well as social and emotional responses, which, in turn, impact sentencing considerations such as culpability and capacity for rehabilitation. *See Graham*, 560 U.S. at 68 (citations omitted).

Specifically, the scientific literature clarifies that different psychological abilities develop at different times, in keeping with gradual biological changes in the brain. Strategic behaviors involving planning and decision-making under demanding and emotionally arousing conditions show steady improvements through late adolescence.[38] Indeed, late adolescents still show

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[37] Rudolph, *supra*, 24 Dev. Cogn. Neurosci. 93–106.

[38] Steinberg et al., *Age Differences in Future Orientation and Delay Discordering* (2009) 80 Child Dev. 28-44 (concluding that brain "remodeling" affecting planning ahead, temporal orientation, anticipation of future consequences, and delay discounting continues to occur throughout early and late adolescence); Steinberg et al., *Are Adolescents Less Mature than Adults?: Minors'*

diminished capacity in such scenarios, exhibiting heightened sensitivity to rewards, threats,[39] social cues,[40] and peer influences[41]—combined with an underappreciation for risks, consequences, and self-regulation.[42] Figure 5 below provides a visual representation of these changes in sensation-seeking and self-regulation.[43] This heightened sensitivity can distract

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Access to Abortion, the Juvenile Death Penalty, and the Alleged APA "Flip-Flop" (2009) 64 Am. Psychol. 592 (finding that "in situations that elicit impulsivity" and are "characterized by high levels of emotional arousal," adolescent decision-making is likely "less mature than adults'"); Gardner & Steinberg, *Peer Influence on Risk Taking, Risk Preference, and Risky Decision Making in Adolescence and Adulthood: An Experimental Study* (2005) 41 Dev. Psychol. 625–35 (hereafter Gardner & Steinberg) (concluding that adolescents are "more inclined toward risky behavior" in the face of peer influence).

[39] Cohen, *supra*, 27 Psychol. Sci. 549–62.

[40] *See, e.g.*, Hare et al., *Biological Substrates of Emotional Reactivity and Regulation in Adolescence During an Emotional Go-Nogo Task* (2008) 63 Biological Psychiatry 927–34 (finding that adolescent brains' weaker top-down regulation of emotional centers, such as the amygdala, affects ability to control behavior in highly emotional contexts); Somerville et al., *Frontostriatal Maturation Predicts Cognitive Control Failure to Appetitive Cues in Adolescents* (2011) 23 J. Cogn. Neurosci. 2129 (concluding that adolescents are "biased to engage in risky behavior at the service of approaching potential rewards").

[41] *See, e.g.*, Gardner & Steinberg, *supra*, 41 Dev. Psychol. 625-35.

[42] Beardslee et al., *An Examination of Parental and Peer Influence on Substance use and Criminal Offending During the Transition from Adolescence to Adulthood* (2018) 45 Crim. Justice Behav. 783–98; Smith et al., *Peers Increase Adolescent Risk Taking Even When the Probabilities of Negative Outcomes Are Known* (2014) 50 Dev. Psychol. 1564–68.

[43] Steinberg et al., *Around The World, Adolescence Is a Time of Heightened Sensation Seeking and Immature Self-Regulation* (2018) 21 Dev. Sci. 1111.

individuals and bias decisions in suboptimal ways for late adolescents, such as placing them at a greater risk for criminal

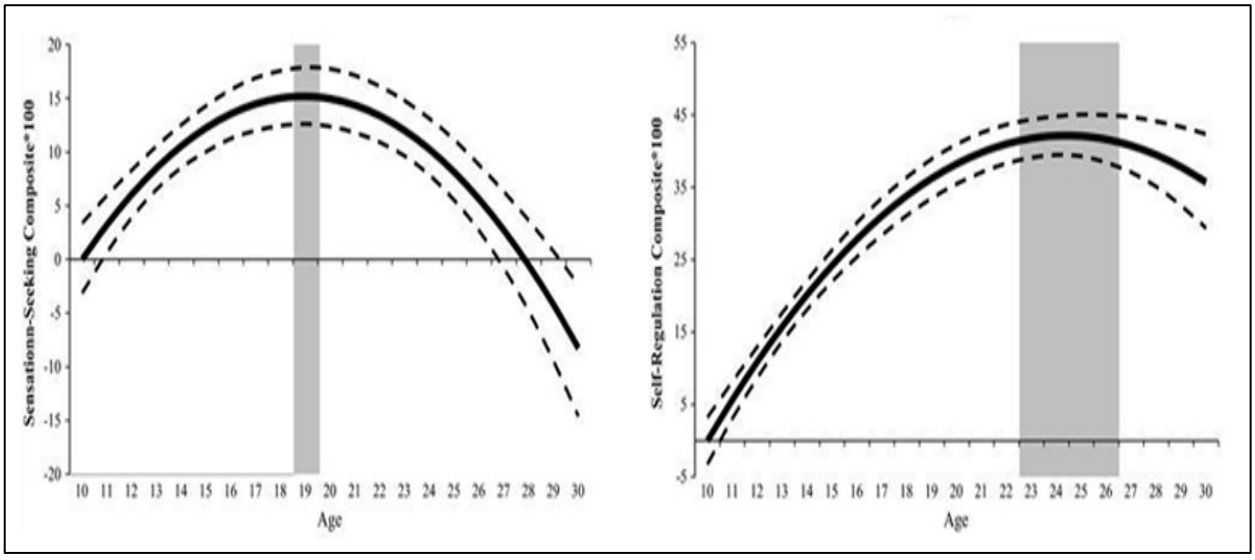

Figure 5 — During late adolescence, sensation-seeking peaks (left) and self-regulation stabilizes (right). Steinberg et al., *supra* note 45.

activity.[44] Under situations of threat, their cognitive capacity is diminished and does not reach mature levels until the end of late adolescence.[45] Indeed, distinguishing the capacity of a 17-year-old and a late adolescent in these situations can be functionally impossible.

The U.S. Supreme Court has recognized that adolescents "are more vulnerable or susceptible to negative influences and outside pressures, including peer pressure." *See Graham*, 560 U.S. at 68 (reasoning that this susceptibility, as well as other considerations, make adolescents less culpable and less deserving

[44] Beardslee, *supra*, 45 Crim. Justice Behav. 783–98; Smith, *supra*, 50 Dev. Psychol. 1564–68; McCord et al., *Co-Offending and Patterns of Juvenile Crime: Research in Brief* (2005) National Institute of Justice, Washington, D.C.
[45] Cohen, *supra*, 27 Psychol. Sci. 549–62.

of the most severe punishments). Several studies have likewise found heightened risk-taking among late adolescents in the presence of peers compared to being alone or in the presence of an adult, whereas peer pressure has little impact on risk-taking among adults.[46] "A necessary condition for an adolescent to stay law-abiding is the ability to deflect or resist peer-pressure," a cognitive process that develops—and remains a work-in-progress—throughout late adolescence.[47]

This wealth of literature on psychological development establishes there is little difference between adolescents and late adolescents regarding cognitive capacity in demanding and emotionally charged situations. Three key findings emerge. First, as a group, adolescents and late adolescents show immature psychological abilities relative to neurocognitive adults, which justifies their special treatment and protection. Second, cognitive, emotional, and social abilities do not develop on the same timeline. Third, these abilities largely coalesce only after late adolescence.[48] As such, late adolescents may make rational decisions in some contexts, such as choosing to attend college or voting, but still lack the ability to engage in mature decision-making in highly charged

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[46] Gardner & Steinberg, *supra*, 41 Dev. Psychol. 625; Silva et al., *Adolescents in Peer Groups Make More Prudent Decisions When a Slightly Older Adult Is Present* (2015) 27 Ass'n Psychological Sci. 327–29.

[47] Zimring, *Penal Proportionality for the Young Offender: Notes on Immaturity, Capacity and Diminished Responsibility* (2000) Youth on Trial 280–81; accord Powers et al., *Effects of Peer Observation on Risky Decision-Making in Adolescence: A Meta-Analytic Review* (2022) 148 Am. Psychol. Ass'n Psychol. Bulletin 783.

[48] *Healthy Development*, *supra*, 16 Ann. Rev. Law Soc. Sci. 203–22.

scenarios—especially where peer influences, threats, or short-term incentives are acutely felt.

C. Trauma and Chronic Stress Impact Brain and Behavioral Development Through Late Adolescence.

Adversity in adolescent experiences and related traumas can alter standard brain development and cognitive and perceptual processes. Such events increase the risk of neurocognitive immaturity during late adolescence,[49] stunted emotional development, and limited self-control and other regulatory

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[49] *See* Schilling et al., *Adverse Childhood Experiences and Mental Health in Young Adults: A Longitudinal Survey* (2007) 7 BMC Public Health 2 (finding increased frequency of ACEs was "significantly" associated with increased prevalence of depressive symptoms, drug use, and antisocial behavior); Dunn et al., *Developmental Timing of Child Maltreatment and Symptoms of Depression and Suicidal Ideation in Young Adulthood: Results from the National Longitudinal Study on Adolescent Health* (2014) 30 Depress. Anxiety 955, 961 (finding "high levels of depression" and increased suicidal ideation in young adults who experienced physical or sexual abuse during childhood); McLaughlin, *The Long Shadow of Adverse Childhood Experiences* (2017) American Psychological Association, <https://www.apa.org/science/about/psa/2017/04/adverse-childhood> (accessed December 28, 2021) (summarizing studies showing adverse childhood experiences including physical or sexual abuse, domestic violence, exposure to violence in the community, experiences that involve deprivation such as neglect, the absence of a caregiver, poverty, and food insecurity contribute to anxiety, depression, aggressive behaviors, post-traumatic stress disorder, and substance abuse issues); Rollins & Crandall, *Self-Regulation and Shame as Mediators Between Childhood Experiences and Young Adult Health* (2021) 12 Frontiers in Psychiatry 1 (summarizing a growing number of studies indicating that adverse childhood experiences lead to increased mental health problems throughout young adulthood).

processes—all of which exacerbate poor decision-making and maladaptive behaviors (including criminal conduct).[50] Given this, late adolescents exposed to significant adversity may nonetheless present a much lower neurocognitive age (even under 18) given the resounding impacts of prior trauma on their cognitive maturity.[51] This important evidence highlights the lack of a scientific basis for treating late adolescents differently from one another or from adolescents, especially those who have experienced adversity and other trauma.

Thankfully, the brain shows remarkable plasticity in its potential to adapt to changing environments, even extreme ones (including chronic stress, neglect, and abuse)[52] throughout the life span.[53] Consequently, even with significant prior trauma, studies

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[50] Bick & Nelson, *Early Adverse Experiences and the Developing Brain* (2016) 41 Neuropsychopharmacology Reviews 179–80.

[51] *See* National Academies of Sciences, *The Neurocognitive and Psychosocial Impacts of Violence and Trauma: Proceedings of a Workshop—In Brief* (2018) 2 ("[T]hreats, abuse, and violence lead to an excessive activation of fear circuitry and stress response systems, which will then compromise normal brain development."); Wade et al., *Associations Between Early Psychosocial Deprivation, Cognitive and Psychiatric Morbidity, and Risk-Taking Behavior in Adolescence* (2021) J. Clinical Child & Adolescent Psychology; Debnath et al., *Long-Term Effects of Institutional Rearing, Foster Care Intervention and Disruptions in care on Brain Electrical Activity in Adolescence* (2020). 23 Developmental Science 1.

[52] Liston et al., *Psychosocial Stress Reversibly Disrupts Prefrontal Processing and Attentional Control* (2009) 106 Proc. Nat'l Acad. Sci. USA 912–17.

[53] Galván, *Adolescent Brain Development and Contextual Influences: A Decade in Review* (2021) 31 J. Research on Adolescence 843–69.

have shown that sufficient time in less impoverished environments and exposure to effective rehabilitative interventions can mitigate the effects of adverse social environments[54] and curb risky and impulsive behaviors in late adolescence and beyond.[55] The brain's long-term capacity to remedy the effects of past adversity when met with appropriate rehabilitative frameworks is remarkable and reveals potential for redemption for all late adolescents.[56]

D. Personality Matures—and Criminal Activity Declines—with Continued Brain Development Through Late Adolescence.

Numerous studies cast doubt on the once-fashionable idea that personality emerges early and remains stable during late adolescence. Research now demonstrates that people generally develop increased self-control and emotional stability as they age, with dramatic increases through late adolescence.[57] *See* Sections II.A & II.B, *supra.* The classic "age-crime" curve illustrated in Figure 6 below reflects, among other things, growing self-control and emotional stability over time. Statistics consistently show that incidence of criminal conduct—especially violent offenses—

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[54] Chetty et al., *The Effects of Exposure to Better Neighborhoods on Children: New Evidence from the Moving to Opportunity Experiment* (2016) 106 American Economic Rev. 855–902.
[55] Baskin-Sommers et al., *Towards Targeted Interventions: Examining the Science Behind Interventions for Youth Who Offend* (2022) 5 Ann. Rev. of Criminology 345–69.
[56] Humphreys et al., *Foster Care Leads to Sustained Cognitive Gains Following Severe Early Deprivation* (2022) 119 PNAS 38.
[57] Roberts & Mroczek, *Personality Trait Change in Adulthood* (2008) 17 Curr. Dir. Psychol. Sci. 31–35.

peaks in the teens and early twenties and then drops significantly throughout late adolescence.[58]

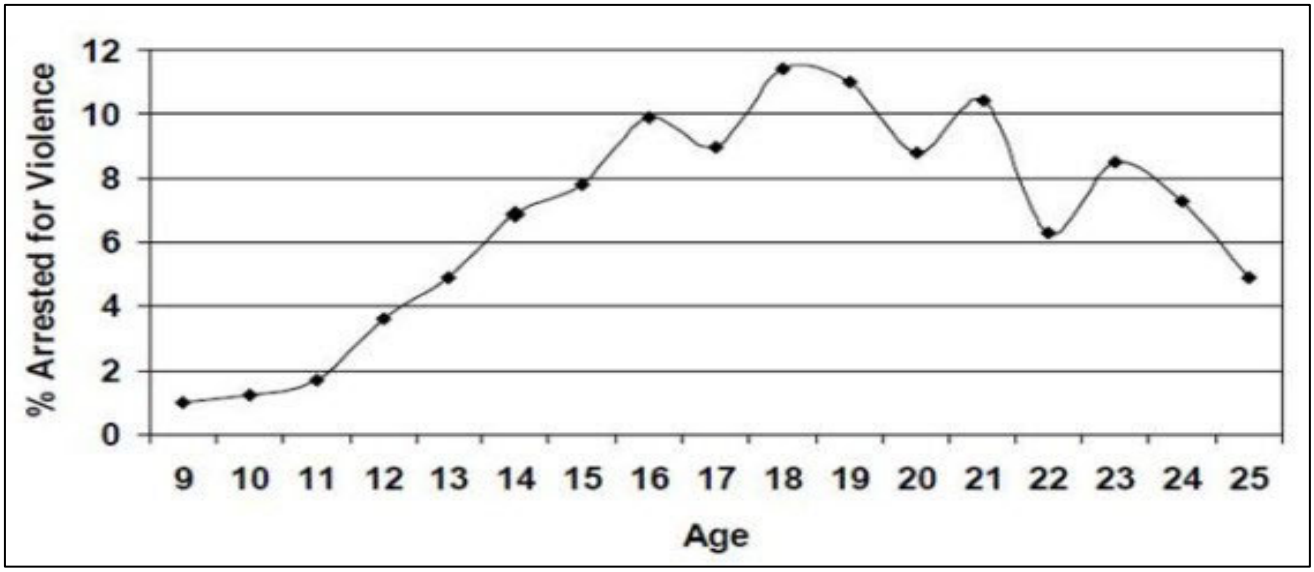

Figure 6 — Percentage of persons arrested for violence by age. National Institute of Justice, *From Youth Justice Involvement to Young Adult Offending* (2014).

Psychological studies track a similar pattern, showing that extreme forms of antisocial behavior and pathological personality traits generally diminish after late adolescence.[59] By the end of late adolescence, psychological and brain development will largely of its own accord reduce the factors that previously contributed to

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[58] Most young adolescents show a reduction in problematic traits often related to criminal behavior even without intervention. See Hawes, *supra*, 77 J. Research in Personality 83–89; Baskin-Sommers et al., *Callous-Unemotional Traits Trajectories Interact with Earlier Conduct Problems and Executive Control to Predict Violence and Substance Use Among High Risk Male Adolescents* (2015) 43 J. Abnormal Child Psychology 1529–41.

[59] Baskin-Sommers, *supra* note 59; Estrada et al., *Trajectories of Psychopathic Traits, Anxiety, and Violence Exposure Differentially Predict Antisociality in Legal System-Involved Youth* (2023) Research on Child and Adolescent Psychopathology, <https://modlab.yale.edu/sites/default/files/files/Trajectories%20of%20Psychopathic%20Traits_2023.pdf>.

criminal behavior. As a result, denying parole eligibility to many late adolescents based solely on their offense or sentence rests on flawed assumptions, including the existence of a "pathological" personality or the need to deter future crimes or protect the public.

* * *

Ultimately, the foregoing science is clear: the brains and behaviors of all late adolescents develop and change rapidly across all of *Miller*'s constitutionally significant metrics up to and including age 25, such that a late adolescent's offense or sentence is simply not a rational dividing line for justifying LWOP. In other words, in evaluating late adolescents "sentenced to LWOP and those sentenced to a parole-eligible life terms," neuroscience confirms that "both groups committed their crimes before their prefrontal cortexes reached their full functional capacity, when their characters were not yet fully formed. Both groups are equally likely to demonstrate improved judgment and decision-making as they reach emotional and cognitive maturity." (*In re Williams* (2020) 57 Cal.App.5th 430, 435.)

III. Section 3051(h)'s Distinction Among Late Adolescents is Irrational And Unsupported by Science.

Amici respectfully submit that section 3051(h), which categorically precludes late adolescents with LWOP sentences from receiving a parole suitability hearing, is irrational and thus contravenes the constitutional promise of equal protection. (U.S. Const., 14th Amend.; Cal. Const., art. I, § 7.) Under both the U.S. and California Constitutions, equal protection is violated where, as here: (1) the state "adopt[s] a classification that affects two or more similarly situated groups in an unequal manner"; and (2)

"the disparate treatment . . . is [not] justified by a constitutionally sufficient state interest." (*People v. Foster* (2019) 7 Cal.5th 1202, 1211–1212.) Assuming, as Petitioner does, that rational basis scrutiny applies, section 3051(h) fails that standard.

A. Section 3051(h) Affects Similarly-Situated Late Adolescents in a Profoundly Unequal Manner.

With respect to the first step in the equal protection analysis, as shown in Section II of this Brief, *all* late adolescents, regardless of offense or sentence, are similarly situated from the perspective of brain and behavioral science. All late adolescents are similarly situated because they universally undergo profound neurological and psychological growth up to and including age 25. In concert with the high court's reasoning in *Miller* concerning the mitigating attributes of adolescence, this ongoing development has decisive effect on their diminished culpability and prospects for reform.

To this end, the Legislature expressly included *all* late adolescents within the ambit of "youthful offender"—consistent with the neuroscientific consensus that the mitigating attributes of late adolescents apply universally. As Justice Liu has pointed out, "[t]he distinctive attributes of youth that mitigate culpability — transitory mental traits and environmental vulnerabilities — " 'are evident in the same way, and to the same degree,' when a juvenile commits robbery or 'when a botched robbery turns into a killing.' " (*People v. Montelongo* (2020) 55 Cal.App.5th 1016, 1037 (conc. stmt. of Liu, J).)

Even though all late adolescents are similarly situated from the perspective of brain and psychological science, section 3051(h) irrationally deprives certain late adolescents of the opportunity for

parole. Denying access to even a parole suitability hearing " 'means denial of hope; it means that good behavior and character improvement are immaterial' " (*Graham v. Florida*, *supra*, 560 U.S. at p. 70; see *id.* at p. 74 [LWOP entails "the State mak[ing] an irrevocable judgment about that person's value and place in society"].) By singling out many late adolescents for unduly harsh sentences based on the flawed presumption that they are more culpable or lack rehabilitative potential, section 3051(h) treats similarly situated late adolescents unequally.

B. Section 3051(h)'s Disparate Treatment of Late Adolescents Frustrates the State's Interests in Aligning Parole Eligibility with Neuroscience and Mitigating Attributes of Late Adolescence.

Turning to the second step of the equal protection analysis, the "disparate treatment" created by section 3051(h) is not " 'justified by a constitutionally sufficient state interest.' " (*Hardin*, *supra*, 84 Cal.App.5th 273, 283; see *People v. Morales* (2016) 63 Cal.4th 399, 408 (*Morales*).) As it stands, section 3051(h) subverts "the legitimate purpose[s] of the law" to: (1) incorporate contemporary neuroscience, as detailed in Section II; and (2) guarantee that all "youthful offenders" have the opportunity to exhibit growth and rehabilitation and receive a meaningful opportunity for release down the line. (*Morales*, at p. 408.)

In 2013, the Legislature enacted section 3051 "explicitly to bring [adolescent] sentencing into conformity with *Graham*, *Miller*, and *Caballero*." (*Franklin*, *supra*, 63 Cal.4th 261, 277.) In doing so, the Legislature acknowledged that "youthfulness both lessens [adolescent] moral culpability and enhances the prospect

that, as a[n adolescent] matures into an adult and neurological development occurs, these individuals can become contributing members of society." (Stats. 2013, ch. 312, § 1.) Accordingly, based on then-current science underlying adolescent "matur[ation]" and "neurological development," the Legislature intended to create a rehabilitation-oriented "process by which growth and maturity of youthful offenders can be assessed and a meaningful opportunity for release established." (*Ibid.*)

By 2017, the Legislature broadened section 3051's "youthful offender" definition to encompass *all* late adolescents. The Assembly bill analysis confirms that the legislative change was again driven by contemporary developments in neuroscience and psychology. (Assem. Com. On Public Safety, Analysis of Assem. Bill No. 1308 (2017-2018 Reg. Sess.) as amended Mar. 30, 2017, at p. 2 [the Legislature intended to "align public policy with scientific research"].) Indeed, the powerful scientific evidence in Section II, *supra*, confirms that for *all* late adolescents, "maturation of the prefrontal cortex [crucial for reasoned judgment and decision-making] occurs primarily during adolescence and is fully accomplished at the age of 25 years" (*ibid.*) and "[t]he parts of the brain that are still developing during this [late adolescent] process affect judgment and decision-making, and are highly relevant to criminal behavior and culpability" (S. Rules Comm.-S. Floor Analysis AB 1308, 3d Sess., at pp. 4–5 (CA. 2017).)

According to the Court of Appeal, consonant with its original objective, the "intended purpose" of section 3051, as amended, was to "permit[] a determination whether a person who committed a

serious or violent crime between the age of 18 and 25 has sufficiently matured and outgrown the youthful impulses that led to the commission of the offense." (*Hardin*, *supra*, 84 Cal.App.5th at p. 255.) In no uncertain terms, the Legislature intended to ensure that as "youthful offenders" "mature[] into an adult and neurological development occurs," their "growth and maturity [] can be assessed and a meaningful opportunity for release established." (Stats. 2013, ch. 312, § 1; see S. Rules Comm. Senate Floor Analysis AB 1308, 3rd Sess., at pp. 7–8 (CA. 2017) ["Punishment should reflect the capacity of a young person to change and mature. Assembly Bill 1308 would ensure that young adults face punishment for their crimes, but also have a meaningful chance for parole."].)

Yet, contrary to these findings and supporting evidence, the Legislature wholly excluded certain late adolescents from any "opportunity to 'demonstrate growth and maturity' to try to secure [their] release." (*Caballero*, supra 55 Cal.4th at p. 268.) Reflexive exclusion of these late adolescents necessarily bars "meaningful consideration of the inmate's age at the time of the offense and demonstrated maturity and rehabilitation." (*People v. Contreras* (2018) 4 Cal.5th 349, 370.) This approach not only frustrates section 3051's overriding purpose, but also stands in stark contrast with Justice Corrigan's admonition that, from a constitutional standpoint, "careful attention should be given to how a defendant's age and maturity actually factor into each case." (*Gutierrez*, 58 Cal.4th at p. 1393 (conc. opn. of Corrigan, J.).) Notably, the Legislature made *no* findings that the mitigating attributes of

some late adolescents are lesser than others. And any such contention would be scientifically unsound given the transformative brain and behavioral growth of late adolescence.

"The concept of equal treatment under the laws means that persons similarly situated regarding the legitimate purpose of the law should receive like treatment." (*Morales*, 63 Cal.4th at p. 408.) From a scientific perspective, amici submit that it is irrational to treat late adolescents sentenced to LWOP differently than other late adolescents for purposes of access to parole suitability hearings intended to assess the exact same traits that render them similarly situated. To the contrary, as the neuroscientific and psychological consensus makes clear, late adolescents as a general matter are less culpable, and more capable of reform.

CONCLUSION

For the foregoing reasons, amici respectfully submit that the judgment of Court of Appeal should be affirmed.

Respectfully submitted,

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APPENDIX — LIST OF AMICI CURIAE

SCHOLAR AMICI[60]:

Dr. Jeffrey Aaron is a clinical and forensic psychologist who practices independently and teaches in the University of Virginia Medical School. Much of his work focuses on forensic evaluation of adolescents and the influence of adolescents' developmental status on their behavior, capacities, risk, and intervention needs.

Dr. Apryl Alexander is the Metrolina Distinguished Scholar in Health & Public Policy and Associate Professor in the Department of Public Health Sciences at the University of North Carolina at Charlotte. Her research focuses on violence, trauma, and clinical treatment of justice-involved youth.

Dr. Jeffrey Arnett is a Senior Research Scholar at Clark University. He has been researching and conceptualizing the age period from 18 to 25, that he termed emerging adulthood, for the past 30 years. He is the originator of the theory of emerging adulthood (human development from age 18-29) and has written many articles and books on this topic. In addition to emerging adulthood, his other scholarly interests include media uses in adolescence, the psychology of globalization, and responses to cigarette advertising.

Dr. Arielle Baskin-Sommers is an Associate Professor of Psychology and Psychiatry at Yale University. Her work focuses

[60] Individual *amici* have signed this Brief in their personal capacities and not on behalf of their affiliated institutions. Titles and institutional affiliations are for identification purposes only.

on identifying and specifying the cognitive, emotional, and environmental mechanisms that contribute to antisocial behavior (e.g., substance use, criminal activity, aggression). She uses findings from her research to develop novel experimental tasks, assessments, and intervention strategies aimed at developing more humane (and scientific) approaches for addressing mental health and crime.

Dr. Sara Boyd is a licensed clinical psychologist, board-certified forensic psychologist, and associate faculty at the Forensic Clinic of the Institute of Law, Psychiatry, & Public Policy (ILPPP) at the University of Virginia. Her primary specialties include Intellectual and Developmental Disabilities and psychological trauma (particularly interpersonal violence) in children and adults. She also develops and conducts trainings for forensic evaluators, mental health care providers and legal professionals, provided under the auspices of ILPPP.

Dr. B.J. Casey is the Christina L. Williams Professor of Neuroscience in the Department of Neuroscience and Behavior at Barnard College, Columbia University. She pioneered the use of functional magnetic resonance imaging to examine the developing human brain, particularly during adolescence, accelerating the emergence of the field of developmental cognitive neuroscience. Her scientific discoveries have been published in over 220 articles in top journals including *Nature Medicine*, *Nature Neuroscience*, *Neuron*, *PNAS*, and *Science*, cited over 65,000 times and highlighted by NPR, PBS, NY Times, and National Geographic. She has received numerous honors including the Association for

Psychological Science Lifetime Achievement Mentor Award, the American Psychological Association Distinguished Scientific Contribution Award, and is an elected member of the American Academy of Arts and Science.

Dr. Hayley Cleary is an Associate Professor of Criminal Justice and Public Policy at Virginia Commonwealth University. She holds a Master of Public Policy and Ph.D. in Developmental Psychology from Georgetown University. Her research lies at the intersection of social science, law, and policy. Her work, funded by the National Science Foundation and Annie E. Casey Foundation, examines adolescent behavior and decision-making in legal contexts, including youths' contact with law enforcement, courts, and correctional systems.

Dr. Alexandra Cohen is an Assistant Professor of Psychology and Core Faculty in Neuroscience and Behavioral Biology at Emory University. Her research focuses on understanding the neural and cognitive mechanisms underlying how emotion and motivation influence learning, memory, and brain function from childhood to adulthood. She has received funding from the American Psychological Association, the National Science Foundation, and the National Institutes of Health to support her work.

Dr. Judith Edersheim is the founding co-director of the Massachusetts General Hospital Center for Law, Brain and Behavior, where she is an attending psychiatrist, as well as an Assistant Professor of Psychiatry at Harvard Medical School. Dr. Edersheim's work at the Center focuses on bringing insights from

neuroscience, neurology, and psychiatry into the legal arena in an effort to improve the justice system, and she lectures extensively in state and federal court settings and the teaching programs of Massachusetts General Hospital, Harvard Medical School, and Harvard Law School.

Dr. Adriana Galván is a Professor of Psychology and the Dean of Undergraduate Education at the University of California, Los Angeles. She is also Co-Executive Director of the UCLA Center for the Developing Adolescent. Her scholarship focuses on the adolescent brain and behavior, with a focus on motivation, learning, and risk-taking and with an eye towards informing youth-relevant policy. She has received multiple awards, including from the Cognitive Neuroscience Society, American Psychological Association, William T. Grant Foundation, National Academy of Sciences, a Fulbright Award, and the Presidential Early Career Award for Scientists and Engineers.

Dr. Catherine Hartley is an Associate Professor of Psychology and Neural Science and is Co-Director of the Institute for the Study of Decision Making at New York University. Her scholarly work focuses on understanding developmental changes in learning and decision-making from childhood to adulthood at both the cognitive and neural levels, with a focus on understanding mechanisms of vulnerability or resilience to psychopathology. She has received multiple awards for her work, including a National Science Foundation CAREER Award, the National Institute of Mental Health Biobehavioral Research Award for Innovative New Scientists, the Association for Psychological Science Janet Taylor

Spence Award for Transformative Early Career Contributions, and the Cognitive Neuroscience Society Young Investigator Award.

Dr. Luke Hyde is a Professor of Psychology and Chair of the Clinical Psychology Area of Psychology with appointments at the Institute for Social Research and the Poverty Solutions Center at the University of Michigan. He is a licensed clinical psychologist in the State of Michigan. He is an expert in neuroscience and the development of aggression, violence, and criminal behavior. His research focuses on the development of high-risk behavior, the interplay of nature and nurture, and factors that promote resilience and desistance from delinquent behavior.

Dr. Catherine Insel is a postdoctoral research scientist at the Zuckerman Mind Brain and Behavior Institute at Columbia University. She received her PhD from Harvard University and is an expert on adolescent brain development. Her research, funded by the National Science Foundation and National Institutes of Health, examines the neurocognitive development of motivation, learning, memory, and cognitive control.

Dr. Daniel Keating is a Professor of Psychology, Psychiatry, and Pediatrics at the University of Michigan. His research and publications (over 200) have focused on adolescent development and neurodevelopment, with a recent specific focus on the role of brain development on risk behavior, funded by the National Institutes of Health. His book on the impact of early life adversity on later development, *Born Anxious* (2017) received the annual award in developmental psychology from the American Psychological Association.

Dr. Robert Kinscherff is a clinical, forensic psychologist and attorney serving as Executive Director of the Center for Law, Brain & Behavior at Massachusetts General Hospital. Over a career of more than three decades, he has filled key forensic positions for the Massachusetts Trial Court, Massachusetts Department of Mental Health, Massachusetts Parole Board, and clinical and forensic mental health systems. He teaches and consults nationally and internationally in practice areas including juvenile and criminal justice, violent and sexual offenders, and professional practice and policy at the nexus of neuroscience, developmental psychology, adversity and trauma, and addictions.

Dr. Grace Mucci is an Associate Clinical (Volunteer) Professor in the Department of Pediatrics at the University of California, Irvine, and licensed clinical psychologist and pediatric neuropsychologist currently practicing in hospital and private practice settings. Board-certified in Pediatric Neuropsychology through the American Board of Pediatric Neuropsychology, she also serves as the Executive Director of the American Academy of Pediatric Neuropsychology.

Dr. Ashley Nellis is a life imprisonment scholar and Co-Director of Research at The Sentencing Project. Her research documents the prevalence of life sentences in America. Her research has been used to inform policies and practices of imposing life sentences on various segments of society including: juveniles, late adolescents, victims of domestic violence, and the elderly.

Dr. Cecil Reynolds is Editor-in-Chief of the peer-reviewed *Journal of Pediatric Neuropsychology*, Emeritus Professor of

Neuroscience and Educational Psychology and distinguished research scholar at Texas A&M University, and a clinical neuropsychologist who also had a clinical practice for more than 25 years treating children, adolescents, and late adolescents. He is in the top quarter of the Stanford list of the top 2% of scientists worldwide and the *Oxford Handbook of the History of Clinical Neuropsychology* ranks him as the 7th most influential person in the history of the field based on the impact of his published works.

Dr. Joseph Ryan is Professor and Associate Dean in the School of Social Work at the University of Michigan. He is also the Director of the Child and Adolescent Data Lab, an applied research center focused on using data to drive policy and practice decisions. His research and teaching build on his direct practice experiences with child welfare and juvenile justice populations.

Dr. Elizabeth Shulman is an associate professor of psychology at Brock University and a developmental psychologist with a focus on psychosocial development across adolescence. She earned her Ph.D. from the University of California, Irvine. Her research focuses on developmental factors that affect risky decision making in adolescence and late adolescence.

Dr. Jennifer Silvers is the Bernice Wenzel and Wendell Jeffrey Term Chair in Developmental Neuroscience at the University of California, Los Angeles. She has published over 60 articles on the brain and behavioral bases of emotion, decision-making, and adolescent development. Dr. Silvers has received funding from the National Science Foundation and National Institutes of Health, as well as awards from the American

Psychological Association, Association for Psychological Science, and the International Society for Developmental Psychobiology.

Dr. Leah Somerville is the Grafstein Family Professor of Psychology at Harvard University and faculty in the Center for Brain Science. Her research focuses on characterizing adolescent brain development, and the consequences of brain development on psychological functioning and well-being. This work integrates behavioral, computational, and brain imaging approaches, including the Human Connectome Project in Development, a large NIH-funded study on brain connectivity development.

Dr. Elizabeth Sowell is a Professor of Pediatrics at the Keck School of Medicine at the University of Southern California. She has been a leader in developmental cognitive neuroimaging for over 20 years and has published over 150 peer review manuscripts in leading journals, including *Nature Neuroscience*, *Nature Medicine*, and the *Lancet*, among others. Her research focuses on adolescent brain and cognitive development as well as the impact of pre- and post-natal exposures to drugs of abuse, environmental toxins (i.e., lead exposure), and family and neighborhood level socioeconomic adversity. Dr. Sowell has been continuously funded by the National Institutes of Health for over 20 years, and she is currently a principal investigator in the Adolescent Brain Cognitive Development study at Children's Hospital Los Angeles.

NONPROFIT AMICI:

Juvenile Law Center, the first non-profit public interest law firm for children in the country, works to reduce the harm of

the child welfare and justice systems, limit their reach, and ultimately abolish them so all young people can thrive. Juvenile Law Center's legal and policy agenda is informed by—and often conducted in collaboration with—youth, family members, and grassroots partners. Since its founding, Juvenile Law Center has filed amicus briefs in state and federal courts across the country to ensure that laws, policies, and practices affecting young people advance racial and economic equity and are consistent with their unique developmental characteristics and human dignity.

The **American Academy of Pediatric Neuropsychology (AAPdN)** is a nationwide nonprofit that advocates, educates, and supports collaboration between individuals and professional specialties with a passion for providing for children, adolescents, and late adolescents. Affiliated with AAPdN, the American Board of Pediatric Neuropsychology (ABPdN) develops specific academy-organized competency in pediatric neuropsychology. AAPdN's mission is to foster a community of pediatric neuropsychologists who meet standards of advanced competency and are committed to advocacy for the neuropsychological health of children, adolescents, and late adolescents.

The **Pacific Juvenile Defender Center (PJDC)** is a statewide public interest nonprofit that works to improve the quality of legal representation for youth in the justice system and to address important juvenile policy issues. PJDC supports more than 1,600 juvenile court lawyers, appellate counsel, law school clinical programs, and nonprofit lawyers to ensure quality representation for young people throughout California and around

the country. Collectively, PJDC and its members have served as counsel in thousands of juvenile court cases, and in amicus briefs before the Court, including *People v. Lara* (2019) 6 Cal.5th 1128; *In re Cook* (2019) 7 Cal.5th 439; *People v. Contreras* (2018) 4 Cal.5th 349; *People v. Franklin* (2016) 63 Cal.4th 261; *People v. Gutierrez* (2014) 58 Cal. 4th 1354; *People v. Caballero* (2012) 55 Cal.4th 262; *In re Alatriste*, S214652; and *In re Bonilla*, S214960.

The Sentencing Project is a nationwide nonprofit established in 1986 to engage in public policy research, education, and advocacy to promote effective and humane responses to crime. The Sentencing Project has produced a broad range of scholarship assessing extreme sentences in jurisdictions throughout the United States and has a specific interest in constitutional sentences for late adolescents.

CERTIFICATE OF COMPLIANCE

I certify that the attached Application of Neuroscience, Psychology, and Juvenile Justice Scholars and Nonprofits to File Amicus Curiae Brief in Support of Appellant; [Proposed] Amicus Curiae Brief uses a 13-point Century Schoolbook font and contains 6,097 words.

Respectfully submitted,

By: /s/ *Kathleen Hartnett*
Kathleen Hartnett
Counsel for Amici Curiae

August 30, 2023

DECLARATION OF ELECTRONIC SERVICE

Case Name: **The People v. Tony Hardin**

No.: **S277487**

I declare:

I am employed in the County of Reston, Virginia. I am over the age of 18 years old and not a party to this matter. My business address is Cooley, LLP, 11951 Freedom Drive, Reston, Virginia 20190. My email address is droelofs@cooley.com.

On August 30, 2023, I electronically served the attached Application of Amicus Curiae Brief of Neuroscience, Psychology, and Juvenile Justice Scholars and Nonprofits to File Amicus Curiae Brief in Support of Petitioner; [Proposed] Amicus Curiae Brief by transmitting a true copy via this Court's TrueFiling system. True Filing system will forward a copy to all parties registered to receive such service. Because one or more of the participants in this case have not registered with the Court's TrueFiling system or are unable to receive electronic correspondence, on August 30, 2023, I placed a true copy thereof enclosed in an envelope, with postage thereon fully prepaid for first-class mail, and deposited the sealed envelope with the United States Postal Service, addressed as follows:

Nima Razfar Office of the Attorney General 300 S. Spring Street, Suite 1700 Los Angeles, CA 90013 Helen H. Hong Office of the Attorney General 600 West Broadway, Suite 1800 San Diego, CA 92101	William D. Temko Munger, Tolles & Olson LLP 350 South Grand Avenue, 50th Floor Los Angeles, CA 90071-3426 Sara A. McDermott Munger, Tolles & Olson LLP 350 South Grand Avenue, 50th Floor Los Angeles, CA 90071 Adeel Mohammadi MUNGER, TOLLES & OLSON LLP 350 South Grand Avenue, 50th Floor Los Angeles, CA 90071 Heidi L. Rummel USC Post-Conviction Justice Project 699 Exposition Boulevard University Park Los Angeles, CA 90089
Attorneys for Plaintiff and Respondent	Attorneys for Defendant and Appellant Mitchell Keiter Office of the Orange County District Attorney 1400 W. Lacey Boulevard Hartford, CA 93230 Amicus Populi

I declare under penalty of perjury under the laws of the State of California that the foregoing is true and correct and that this declaration was executed on August 30, 2023, at Ashburn, Virginia.

Dawn Roelofs	/s/ *Dawn Roelofs*
Declarant	Signature

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