# UNITED STATES DISTRICT COURT NORTHERN DISTRICT OF FLORIDA TALLAHASSEE DIVISION

AUGUST DEKKER, et al.,	
Plaintiffs,	
v.	Case No. 4:22-cv-00325-RH-MAF
JASON WEIDA, et al.,	
Defendants.	

# EXPERT REPORT OF SOPHIE SCOTT, PH.D.

## Pursuant to 28 U.S.C. 1746, I declare:

- 1. I have been retained by counsel for Defendants as an expert witness in connection with the above-captioned litigation. I have actual knowledge of the matters stated in this report. My professional background, experience, and publications are detailed in my curriculum vitae. A true and accurate copy of my curriculum vitae, which includes a list of my publications, is attached as Exhibit A to this report.
- 2. I have testified as an expert witness in the following cases, at trial or in deposition in the last four years: Bell v Mrs A vs Tavistock and Portman Trust, Case No: CO/60/2020, December 2020.
- 3. I am being compensated at an hourly rate for actual time devoted, at the rate of \$400 per hour including report drafting, testimony, and consultation. My compensation does not depend on the outcome of this litigation, the opinions I express, or the testimony I provide.
- 4. The opinions expressed in this report are based on my training and experience as a neuroscientist, my reading and my assessment of the relevant neuroscientific literature on brain development, and the potential effects of gonadotropin-releasing hormone (GnRH) agonists (the most common form of what are often called puberty blockers) on the developing brain.
- 5. If called to testify in this matter, I would testify truthfully and based on my expert opinion. The opinions and conclusions I express herein are based on a reasonable degree of scientific certainty.

### Introduction

- 6. I am the Director of University College London's (UCL's) Institute of Cognitive Neuroscience. I have published over 130 peer reviewed scientific papers, including papers in Nature, Science, and the Proceedings of the Academy of Natural Sciences. I am a fellow of the Academy of Medical Sciences, and of the British Academy. Since my PhD was awarded in 1994, I have been working in cognitive neuroscience, a scientific field that examines the relationships between human behaviour to the human brain, and how these can be affected by age, disease and individual differences. *See* Attached Curriculum Vitae.
- 7. As a neuroscientist I am very familiar with the existence of variations of sexual preference, and the existence of variations in gender identity. I think that the anecdotal evidence we have suggests that transition may, for some younger people, be an effective treatment for gender dysphoria, and that the medical approaches taken to achieve this may therefore be appropriate. Thus is it entirely possible that the use of puberty blockers is appropriate in some exceptional cases of gender dysphoria in prepubescent and adolescent individuals. My concern is that we do not yet have enough evidence about the best ways to identify the individuals for whom they are appropriate: we have not identified any biological markers or other characteristics to identify individuals for whom GnRH antagonists might provide effective; we do not have any reliable studies that show which young gender dysphoric individuals will remain gender dysphoric after adolescence; and we thus do not yet know who might benefit from

this highly medicalised and largely non-reversible treatment. I am also very concerned that the implications of the effects of puberty blockers on the developing brain and body are not well understood. In both of these areas much more research is needed.

- 8. All cultures recognise the onset of adolescence as the start of the entry into the adult world: it is a journey into that world, and a journey that takes place over several years. In 2005 the US supreme court, influenced partly by this emerging neuroscience research, increased the minimum age for capital punishment to be the same as that for voting and serving on juries. Around the world, many such limitations on the responsibility for teenagers for their own actions are in place – alongside laws which mean that teenagers could not engaging in risky behaviours that could place them or others at risk or having to live with long terms consequences (e.g. ages for driving, drinking alcohol, age of consent, getting a tattoo). Much of this reflects a lay understanding of what neuroscience is now confirming – there is variation from child to child, but teenage brains on the whole are structurally and functionally different from adult brains, and this affects both their engaging with risky behaviour, and their understanding of the implications of risky behaviour.
- 9. The human brain is formed of approximately 89 billion brain cells, or neurones, most of which are grown during gestation (Bayer et al. 1993; Rakic 1995). Following birth, there is a further period of extended brain development. Directly after birth, the brain grows rapidly, quadrupling in size

between birth and age 6, when it is roughly 90% the size of an adult brain. However the pattern of growth is underpinned by some complex changes that are occurring. These are:

- Synaptic pruning
- Myelination of different brain networks
- Differential growth of specific functional and anatomical areas.
- 10. Before I go into this in detail it's important to note that brain cells, or neurones, are formed of a cell body, with a long projection (an axon) and branch-like shorter projections (dendrites) from the cell body or from the far end of the axon. The axons can be thought of as ways the neurone can connect to more distant neurones, while the dendrites connect to nearby neurones. These connections are called synapses. Changes in the brain – associated with learning and development - occur largely through the connections between neurones, which can be through the strengthening of existing connections, or through the development of new dendritic connections. The axons are coated in a slim fatty sheath, called myelin: this enables the electrical discharges that enable transfer of information in the brain to be propagated rapidly along the length of the axon. Myelination is a process that increases the speed and efficiently of neural function. Neurones are highly organised in the brain, with the cell bodies forming structure layers on the surface of the brain (the cortex), as well as in sub cortical nuclei of cell bodies: the axons form tracts of connections between cortical areas, to and from sub cortical areas, and between the two hemispheres of the brain.

These tracts look white, due to the fatty myelin sheaths: this leads to the name 'white matter' for these tracts or connective networks. In contrast, the unmyelinated neuronal cell bodies look grey, hence the term 'grey matter'.

- are created between neurones: this is known as *synaptic exuberance*. In the early years of life these are rapidly pruned, at first quickly, then more slowly. During adolescence a more adult profile of synaptic connections starts to appear: this appears most slowly in prefrontal fields compared to sensory and is still not established fully at age 18yrs (Huttenlocher and Dabholkar, 1997). The relationship between synaptic exuberance and pruning and their implications for the developing brain and experience are still being explored, but in terms of brain connectivity, the adult pattern is not yet established at 18: development continues into the early 20s.
- 12. Myelination in the human brain begins in visual brain areas a couple of months before birth and continues in other sensory brain areas over the first year. This process continues in other cortical and subcortical systems into the middle of the third decade. This has been expressly linked to the development of cognitive skills in children and adolescents, as myelination greatly improves the speed of condition of neurones, and hence their efficiency. Myelination proceeds in a roughly caudal to rostral direction in the brain, which means form back to front. This means that it is frontal and prefrontal fields that are those continuing to be myelinated into the mid 20s: this has been confirmed by more recent studies

looking at fractional anisotopy in the brain (Lebel et al., 2008). At 18yrs old, the connections to the frontal lobes are not myelinated like a mature adult brain, and this is likely to affect frontal lobe functions.

13. Throughout childhood, the brain grows and changes: this involves a non-linear pattern of change in the proportion of white and grey matter, which may partly involve changes in myelination (see above) and also the loss of cells through cell death (Sowell et al. 2004). A recent study looking at this pattern into adolescence found that "First, we found evidence for continued development of both intracranial volume (ICV) and whole brain volume (WBV) through adolescence, albeit following distinct trajectories. Second, our results indicate that CGMV is at its highest in childhood, decreasing steadily through the second decade with deceleration in the third decade, while CWMV increases until midto-late adolescence before decelerating" (Mills et al, 2016). This indicates that considerable changes are still happening in the structure of the adolescent brain. In terms of specific brain areas, while the cortex continues to thin through adolescence, the decreases are most marked in the parietal lobes and least marked (or growth is seen) in temporal and prefrontal fields (Tamnes et al, 2017).

# **Implications**

14. The pattern of maturation of the brain in adolescence suggests a particular issue with frontal lobe functions – the frontal and temporal lobes are showing a different pattern of change (in terms of movement towards adult profiles) compared to more caudal fields, and the frontal lobes are the last to be

fully myelinated. The frontal lobes are associated with complex cognitive control processes, so called 'meta-cognitive processes' that enable us to plan our behaviour, control our responses, to be able to adapt our behaviour to different contexts and requirements, and to anticipate the implications and consequences of behaviour. The absence of mature frontal lobe connectivity and functions has been linked to increased impulsivity and risk-taking in adolescence, and to their greater susceptibility to peer opinions and behaviour (Blakemore and Robbins, Nature Neuroscience, 2012). Functional imaging studies – addressing how brains function under different task requirement – have shown that while adults recruit frontal lobe networks during decision making tasks, teenagers are more likely to recruit 'limbic networks' i.e. sub cortical networks linked more to emotional processing and reward processing: the implication is that the differential integrity of frontal lobe connectivity leads to teenagers making different, more risky decisions than adults, and relying on different brain networks to do so. This is backed up by behavioural studies showing that when decision making is 'hot' (i.e. more emotional), under 18yr olds make less rational decisions than when the responses are being made in a colder, less emotional context.

15. Puberty blockers (specifically, gonadotrophin-releasing hormone agonists) work by preventing the release of gonadotrophin-releasing hormone from the hypothalamus. Gonadotrophin releasing hormones have many effects, including stimulating the gonads (testes and ovaries) to produce testosterone and oestrogen. In childhood, the level of Gonadotrophin releasing hormones is very

low, but an increase in this prompts the onset of puberty, with the release of testosterone and oestrogen; these in turn have masculinising or feminising effects on the bodies and the brain. As puberty is associated with very marked changes in the structure of the brain (as outlined above) the use of puberty blockers may have serious consequences for the development of the human brain. We know from studies on sheep (Nuruddin et al, 2013) that treatment around the onset of puberty with gonadotrophin-releasing hormone agonists is associated with significant differences in the size of the amygdala (found to be larger in treated animals) and this was linked to some differences in emotional reactions. The male treated sheep showed greater approach responses and more risk taking behaviours, while the treated female sheep showed higher levels of anxiety and greater avoidance behaviour (Wojniusz et al, 2011). A behavioural study of natal girls who were treated for precocious (early) puberty with Gonadotrophin releasing hormone agonists (Wojniusz 2016) found that they also showed significant greater emotional reactivity on one of the tests used, relative to the control group. The treated girls also showed significantly lower heart rates than the untreated control group. In a commentary on this article (Hayes, 2017) it was pointed out that there were also notably lower scores on IQ measures and sub scales in the group of girls who were treated with Gonadotrophin releasing hormone agonists. He points out that "their reassuring statement in the abstract that girls undergoing GnRHa treatment for CPP and controls "showed very similar scores with regard to cognitive performance" and their conclusion that "GnRHa treated girls do not differ in their cognitive functioning ... from the same age peers" (Wojniusz et al., 2016) may be overly optimistic. These statements minimize the fairly substantial difference found in IQ scores" (Hayes, 2017). Hayes also points to an older study that found a significant drop in IQ associated with taking triptorelin acetate to treat precocious puberty (Mul et al, 2001). Note that in all of these cases, in humans and other mammals, we cannot say if the results are due to direct effects of the Gonadotrophin releasing hormones on the brain, heart and behaviour, or if they are secondary to this (e.g. due to the altered levels of testosterone or oestrogen, or changes in the heart rate itself). All the papers I can find suggest that we need much more data on the long-term brain effects of Gonadotrophin releasing hormones when administered around puberty, the effects this can have on behaviour, and the extent to which any of this is altered if the treatment with Gonadotrophin releasing hormones is stopped.

16. I am very concerned that the current treatment regime is exposing young people to significant risk of harm. The greater susceptibility to peer pressure in those under 18 may make them especially vulnerable to risk taking, and this may well be enhanced by social media, where actions can be encouraged without any responsibility for outcomes. We need more research to be able to determine the potential for puberty blockers to be effective in alleviating some aspects of gender dysphoria, and to be able to differentiate those who might be helped by this treatment from those who will not. Furthermore, given the risks of puberty blocking treatment, and the fact that these will have irreversible, lifelong

effects, it is very possible for an adolescent to be unable to fully grasp the implications of puberty-blocking treatment, even if the risks are well explained. All the evidence we have suggests that the complex, emotionally charged decisions required to engage with this treatment are not yet acquired as a skill at this age, both in terms of brain maturation and in terms of behaviour.

I declare, pursuant to 28 USC § 1746, under penalty of perjury that the foregoing is true and correct. Executed on February 16th, 2023.

/s/ Sophie Scott
Sophie Scott, Ph.D.

# Exhibit "A"

# PROF SOPHIE KERTTU SCOTT CBE, FMEDSCI, FBA

Date of Birth: 16-11-1966

Address: Institute of Cognitive Neuroscience, UCL, 17 Queen Square,

London, WC1N 3AR

email: sophie.scott@ucl.ac.uk

#### **CURRENT POSITION**

2019 – Director, Institute of Cognitive Neuroscience, University College London

## **EDUCATION/QUALIFICATIONS**

1994 University College London, PhD in Cognitive Science 1990 Polytechnic of Central London, BSc (Hons) 2:1, Psychology

#### **PROFESSIONAL HISTORY**

1993-1998 MRC Applied Psychology Unit, Cambridge, Senior Scientific Officer

1998-2001 Research Fellow, Institute of Cognitive Neuroscience, UCL.

2001-2005 Wellcome Career Development Fellow, Dept. Psychology, UCL

2004 - Group Leader, Speech Communication Lab

2006- Professor of Cognitive Neuroscience, UCL

2005-2016 Wellcome Trust Senior Fellow, Institute of Cognitive Neuroscience

2013-2019Deputy Director, Institute of Cognitive Neuroscience, UCL

2019 – Director, Institute of Cognitive Neuroscience, University College London

I took maternity leave between June 2006-June 2007.

#### PRIZES AND RECOGNITION

2022 Awarded an Honorary degree by the University of Westminster

2021 awarded the Michael Faraday prize by the Royal Society

2020 appointed Commander of the Most Excellent Order of the British Empire for services to Neuroscience

2019 Royal Literature Society "Reading Matters" prize, for "The

Neuromantics", my podcast with poet and writer Dr Will Eaves

2017 presented the Royal Institution Christmas Lectures

2017 Royal Society Summer Science Exhibition, "What's in a Voice?"

2016 elected as a Fellow of the British Academy

2016-2018 UCL TEDx License holder

2015 spoke at the annual TED conference, Vancouver (talk has been viewed over 4.4 million times on TED.com).

2015 gave Prize Lecture at the Physiology Society meeting, Cardiff.

2014 included in Who's Who

2013 won UCL Provosts' Award for Public Engagement (grade 8 and above category).

2012 Royal Society Summer Science Exhibition, "LOL: Science and Art of Laughter"

2012 Elected as Fellow of the Academy of Medical Sciences

2003 Royal Society Summer Science Exhibition, "Science of Speaking"

#### SUPERVISION OF GRADUATE STUDENTS

Since 2002, 14 PhD students supervised at UCL, and 35 MSc students at UCL, 2 at City University and one at the University of Reading

#### **EDITORIAL WORK**

2015 – associate editor for *The Psychologist* (British Psychological Society monthly journal).

2009 – 2014 Editorial Board of *Cognitive Neuroscience* 

2010 - 2013 Section Editor, Language, Neuropsychologia

2008 – 2015 Associate Editor of Brain and Language

2004 –2009 Associate Editor of the *Quarterly Journal of Experimental Psychology* 

#### MANAGEMENT AND FACILITATION

2020 - PALS Director for EDI

2015 – member, PALS Academic Careers and Diversity Committee

2015-2019 – chair of ICN Public Activities Committee

2014 – 2019 deputizing for Prof Neil Burgess (ICN Director) at Faculty of Brain Sciences' Faculty Executive Committee meetings

2004 – representing the Speech Communication Group at the ICN Group Leader's committee

## **JUDGING AND COMMITTEES**

2022 - member of ILCB advisory board

2019- Chair of Board of Trustees, Told By An Idiot theatre company (<a href="https://www.toldbyanidiot.org/about/">https://www.toldbyanidiot.org/about/</a>)

2017- 2022 member of the Royal Society Dorothy Hodgkin Fellowship Committee

2015- associate Editor of the Psychologist and Digest Policy Advisory Committee, British Psychological Society 2015 Judge, Comment Awards

2015, 2018 Judge, Philip Leverhulme Prize

2014 Judge, Wellcome science writing prize

2013- Trustee, Jericho House theatre company (registered charity number 1131984)

#### EXTERNAL EXAMINING

2009-2012 External Examiner, BSc Psychology, University of Sussex 2009-2013 External Examiner, MSc Cognitive Neuroscience, University of York

2015-2019 External Examiner, BSc Psychology, University of Reading

#### **TEACHING**

2011-2014 Course convener, "Theories and Paradigms in Cognitive Neuroscience" UCL MSc in Cognitive Neuroscience.

2015- Module Convener, "Science Communication for Cognitive Neuroscientists" UCL MSc/MRes in Cognitive Neuroscience.

2023- Module Convener, "Power, Inclusion, Exclusion and Working with local communities".

#### **GRANTS**

Wellcome Trust Hub award development funding, for 'Talking Funny', £13000 over 18 months

Wellcome Trust Public engagement award, for "What's in a Voice" exhibit at the Royal Society Summer Science Exhibition, £20,000 over 12 months. Wellcome Trust People Award for public engagement activities: for LOL event at the Royal Society, awarded 2012, amount £19,000 over 12 months. Wellcome Trust Senior Fellowship, awarded April 2010 "Neurobiology of speech communication - cognition, plasticity, and social interactions" total amount awarded £1,184, 506, over 60 months.

Wellcome Trust Senior Fellowship, awarded May 2004 'the Neurobiology of Speech Perception – Cognitive and Clinical Links'. Total amount awarded £800,270, over 60 months.

Wellcome Trust RCDF grant, from April 2001-April 2005, 'the Neurobiology of speech perception'. Total amount awarded £358,376, over 48 months.

Marie Curie Incoming Scientist Fellowship, awarded November 2004, sponsoring Narly Golestani, £100,914 over 24 months.

ESRC grant awarded for new post doctoral researchers, sponsoring Charlotte Jacquemot, awarded May 2004, £30,919 awarded over 12 months.

ESRC grant awarded for new post doctoral researchers, sponsoring Patti Adank, awarded May 2005, £31,591 awarded over 12 months

ESRC +3 studentship award, awarded May 2004 (supervising Carolyn McGettigan)

British Academy meetings award, for the John Morton Festschrift, £2000 Experimental Psychology Society research seminar award, for the John Morton Festschrift, £3000

British Association for the Advancement of Science award for Key events in National Science and Engineering Week, 2008, £1000

#### **ACADEMIC SUPERVISION**

2001 -2004 Supervised Charvy Narain, the research assistant on my Wellcome RCDF award. Charvy was awarded a PhD in 2003 and took a job as an editor at Nature Neuroscience: she is now a Scientific Outreach Manager at the University of Oxford.

2002 -2006 supervised Disa Sauter, a research student in the Dept. Psychology at UCL. Disa passed her PhD viva without corrections in December 2006, and currently holds her a lecturer position at the University of Amsterdam..

2004 -2005 Supervised Dr. Charlotte Jacquemot, a post-doctoral fellow. Charlotte has been awarded a permanent CNRS position in France, which she began in 2006

2004 - 2012 supervised Carolyn McGettigan, a research student in the Dept of Human Communication Sciences. Carolyn passed her PhD viva without corrections in March 2008, was employed as a post-doctoral fellow on my Wellcome SRF grant until 2012 when she left to take up a lectureship at RHUL. She is now a Professor at UCL.

2005 -2006 supervised Dr. Patti Adank, a post-doctoral fellow. Patti is now a Professor at UCL.

2005 -2008 Supervised Dr Frank Eisner as a post-doctoral fellow on my Wellcome SRF award. Since January 2009, Frank held post-doc position at the Max-Planck-Institute for Psycholinguistics in Nijmegen, and is now a researcher at the Centre for Cognition of the Donders Institute for Brain, Cognition and Behaviour.

2005 -2007 Supervised Dr. Jonas Obleser as a post-doctoral fellow on my Wellcome SRF award. Since April 2007, Jonas has held a Junior Staff Scientist position at the Max Planck Institute for Human Cognitive and Brain Sciences, Leipzig, Germany, where ran his own research group: he is now a Professor at the Department of Psychology, University of Lübeck. 2005-2007 supervised Dr. Narly Golestani, a post-doctoral fellow, who now heads the Brain and Language Lab at the Cognitive Science Hub of the

University of Vienna, Austria, and at the Department of Psychology at the University of Geneva, Switzerland.2008 -2009 – supervised Nicholas Abreu, who has a Fulbright Scholarship to work in the UK for a year. Nicholas started medical school at Harvard in September 2009.

2009 - 2013 Dr Zarinah Agnew appointed as a post-doctoral fellow on my Wellcome SRF grant. Zarinah now works at UCSF as a post-doc in John Houde's lab.

2010 -2015 supervised Pradheep Shanmugalingam as an ESRC funded PhD student. Pradheep is now training in simultaneous translation.

2012 - 2015 supervising Kyle Jasmin as a PhD student on the UCL/NIH program (NIH supervisor Alex Martin). Kyle joined my lab as a post-doctoral fellow and then was awarded a a Leverhulme research fellowship at Birkbeck: he is now a lecturer at Royal Holloway UL.

2012 -2013 Nadine Lavan joined my lab as an RA for 12 months. Nadine left to take up a PhD place at RHUL: she now holds a Wellcome Fellowship at QMUL.

2013 - Supervising Sophie Meekings as an ESRC funded PhD student. Sophie was awarded a BA fellowship at Newcastle University, and was awarded a Dorothy Hodgkin fellowship in 2021, held at University of York. 2013 - Supervising Sinead Chen as a PhD student funded by a grant from the Taiwanese Government. Sinead now works for a policy think tank in Taiwan.

2013 -2015 Samuel Evans joined my lab as a post-doc on my Wellcome SRF grant. Now a lecturer at the University of Westminster 2013 – 2014 Dana Boebinger joined my lab as an RA. Dana left in August

2013 – 2014 Dana Boebinger Joined my lab as an RA. Dana left in Augus 2014 to start a PhD at Harvard, she is now a post do at the University of Rochester.

2015 – 2016 César Lima joined my lab as a senior post-doctoral fellow on my Wellcome SRF grant. César Lima is Assistant Professor of Psychology at Iscte - University Institute of Lisbon since 2017.

2017- Qing Cai joined my lab as a PhD student with funding from the Chinese government from 2018.

2017- Alexis Deighton McIntyre joined my lab as a PhD student with a UCL Graduate School studentship. In October 2021 she joined the MRC CBU as a postdoctoral researcher.

2018-Addison Billings joined my lab as a PhD student

2019 - Efe Caswell Niven joined my lab as a PhD student

SCIENTIFIC PUBLICATIONS-REFEREED ARTICLES

- 1. Scott, SK, Jasmin, K (2022) Rostro-caudal networks for sound processing in the primate brain, Frontiers in Neuroscience, 16, 1076374, 10.3389/fnins.2022.1076374
- Scott, SK, Cai, CQ, Billing, A (2022) Robert Provine: the critical human importance of laughter, connections and contagion. Philosophical Transactions of the Royal Society B-Biological Sciences, 377(1863) 20210178 10.1098/rstb.2021.0178
- 3. Scott, SK (2022) Why public engagement is important for neuroscientists. Nature Reviews Neuroscience, 23(8):453-4.
- 4. MacIntyre, AD, Scott, SK (2022) Listeners are sensitive to the speech breathing time series: Evidence from a gap detection task. Cognition, 225, 105171 10.1016/j.cognition.2022.105171
- 5. Conde, T, Correia, AI, Roberto, MS, Scott, SK, Lima, CF, Pinheiro, AP (2022) The time course of emotional authenticity detection in nonverbal vocalizations, Cortex, 151:116-132.

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- 7. Billing, ADN, Scott, SK (2022) Possible limitations of perceptual studies for informing production networks-The case of laughter. Cortex, 148: : 218-221.
- 8. MacIntyre, AD, Cai, CQ, Scott, SK (2022) Pushing the envelope: Evaluating speech rhythm with different envelope extraction techniques, Journal of the Acoustical Society of America. 151(3):2002:2026.
- 9. Alderson-Day B, Moffatt, J, Lima, CF, Krishnan, S, Fernyhough, C, Scott, SK, Denton, S, Leong, IYT, Oncel, AD, Wu, YL, Gurbuz, Z, Evans, S (2022) Susceptibility to auditory hallucinations is associated with spontaneous but not directed modulation of top-down expectations for speech. Neuroscience of Consciousness, 2022(1) <a href="https://doi.org/10.1093/nc/niac002">https://doi.org/10.1093/nc/niac002</a>
- 10. Kamiloglu, RG, Tanaka, A, Scott, SK, Sauter, DA (2022) Perception of group membership from spontaneous and volitional laughter. Philosophical Transactions of the Royal Society B-Biological Sciences, 377: 20200404.
- 11. Pinheiro, AP, Anikin, A, Conde, T, Sarzedas, J, Chen, S, Scott, SK, Lima, CF (2021) Emotional authenticity modulates affective and social trait inferences from voices. Philosophical Transactions of the Royal Society B-Biological Sciences 376: 20200402.
- 12.Billing ADN, Cooper RJ, Scott SK (2021) Pre-SMA activation and the perception of contagiousness and authenticity in laughter sounds, Cortex, 143: 57-68.
- 13.Scott SK (2021) The neural control of volitional vocal production-from speech to identity, from social meaning to song. Philos Trans R Soc Lond B Biol Sci, 377(1841):20200395.

- 14.Lavan N, Scott SK, McGettigan C (2017) Impaired generalization of speaker identity in the perception of familiar and unfamiliar voices. J Exp Psychol Gen., 145(12):1604-1614
- 15.Cosme G, Rosa PJ, Lima CF, Tavares V, Scott S, Chen S, Wilcockson TDW, Crawford TJ, Prata D (2021). Pupil dilation reflects the authenticity of received nonverbal vocalizations. Scientific Reports. 11:3733.
- 16.Meekings S, Scott SK. (in press) Error in the Superior Temporal Gyrus? A Systematic Review and Activation Likelihood Estimation Meta-Analysis of Speech Production Studies. Journal of Cognitive Neuroscience.
- 17.Cai Q, Chen S, White SJ, Scott SK (2019). Modulation of humor ratings of bad jokes by other people's laughter. Current Biology. 29(14):R677-R678
- 18.Scott SK (2019) From speech and talkers to the social world: The neural processing of human spoken language. *Science*. Oct 4;366(6461):58-62.
- 19. Jasmin K, Lima CF, Scott SK (2019) Understanding rostral-caudal auditory cortex contributions to auditory perception. Nature Reviews Neuroscience, 20(7):425-434
- 20.Lima CF, Anikin A, Monteiro AC, Scott SK, Castro SL (2018) Automaticity in the recognition of nonverbal emotional vocalizations. Emotion. 2018 May 24. doi: 10.1037/emo0000429.
- 21. Neves L, Cordeiro C, Scott SK, Castro SL, Lima CF (2018) High emotional contagion and empathy are associated with enhanced detection of emotional authenticity in laughter, Q J Exp Psychol (Hove). Nov;71(11):2355-2363.
- 22.Krishnan S, Lima CF, Evans S, Chen S, Guldner S, Yeff H, Manly T, Scott SK (2018) Beatboxers and Guitarists Engage Sensorimotor Regions Selectively When Listening to the Instruments They can Play. Cereb Cortex. 2018 Nov 1;28(11):4063-4079.
- 23. Smith AV, Proops L, Grounds K, Wathan J, Scott SK, McComb K. (2018) Domestic horses (Equus caballus) discriminate between negative and positive human nonverbal vocalisations. Sci Rep. 2018 Aug 29;8(1):13052.
- 24. Lavan N, Burton AM, Scott SK, McGettigan C. (2018) Flexible voices: Identity perception from variable vocal signals. Psychon Bull Rev. 2018 Jun 25. doi: 10.3758/s13423-018-1497-7.
- 25.Agnew ZK, Banissy MJ, McGettigan C, Walsh V, Scott SK (2018) Investigating the Neural Basis of Theta Burst Stimulation to Premotor Cortex on Emotional Vocalization Perception: A Combined TMS-fMRI Study. FRONTIERS IN HUMAN NEUROSCIENCE Volume: 12 Article Number: 150 Published: MAY 15 2018
- 26. Agnew ZK, McGettigan C, Banks B, Scott SK (2018) Group and individual variability in speech production networks during delayed auditory feedback.

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- 27.O'Nions E, Lima CF, Scott SK, Roberts R, McCrory E, Viding E (2017) It's no laughing matter: Reduced laughter contagion in boys at risk for psychopathy. Current Biology, 27(19):3049-3055.
- 28.Alderson-Day B, Lima CF, Evans S, Krishnan S, Shanmugalingam P, Fernyhough C, Scott SK (2017) Distinct processing of ambiguous speech in people with non-clinical auditory verbal hallucinations, Brain, 140(9), 2475–2489.
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- 30.Lavan N, Scott SK, McGettigan C (2017) Impaired generalization of speaker identity in the perception of familiar and unfamiliar voices. J Exp Psychol Gen., 145(12):1604-1614
- 31.Lima CF, Brancatisano O, Fancourt A, Müllensiefen D, Scott SK, Warren JD, Stewart L (2016) Impaired socio-emotional processing in a developmental music disorder. Sci Rep. 2016 Oct 11;6:34911.
- 32.Lima C, Krishnan S, Scott SK (2016) Roles of Supplementary Motor Areas in Auditory Processing and Auditory Imagery. Trends in Neurosciences, 39(8):527-42.
- 33. Wilkes J, Scott SK (2016) Poetry and Neuroscience: An Interdisciplinary Conversation. *Configuration*,;24(3):331-350
- 34. Meekings S, Evans S, Lavan N, Boebinger D, Krieger-Redwood K, Cooke M, Scott SK (2016) Distinct neural systems recruited when speech production is modulated by different masking sounds. *Journal of the Acoustical Society of America*. 140(1): 8-19
- 35. Jasmin KM, McGettigan C, Agnew ZK, Lavan N, Josephs O, Cummins F, Scott SK (2016) Cohesion and joint speech right hemisphere contributions to synchronized vocal production. *Journal of Neuroscience*, 36(17):4669-80
- 36.Evans, S, McGettigan, C, Agnew, ZK, Rosen, S & Scott, SK (2016) Getting the cocktail party started: Phasic and sustained neural responses in the perception of masked speech. *Journal of Cognitive Neuroscience*, 28(3):483-500.
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