



Percussive Notes Online Research Edition

A scholarly publication of the Percussive Arts Society

Volume II • April 2024

PERCUSSIVE
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Percussive Notes

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Percussive Notes Online Research Edition is a peer-reviewed, online publication that aims to promote advanced research and expand academic perspectives on topics in percussion relating to areas including, but not limited to, historical musicology, critical theory, aesthetics, musical analysis, performance practice, interdisciplinary studies, ethnomusicology, and interviews.

Editor

Sean Millman, Ph.D.

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Contributors

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John MacDonald is a writer, composer, and drummer based in the San Francisco Bay area. After completing his studies at the Berklee College of Music and the New England Conservatory, he performed alongside Taylor Dayne opening for Earth, Wind, & Fire, Guggenheim Fellow David Fiuczynski, and David Gilmore. While freelancing as a composer and sound designer for video games and short films, John continues to present his ludomusicological research on breakbeat music in games, with recent presentations at Oxford University, the Pop Culture Association, the University of Calgary, and the University of Manchester.

Marc Dicciani is a Professor of Drumset at the University of the Arts in Philadelphia, and a busy performer, teacher, clinician, and researcher with dozens of international concert dates and clinics throughout the year. He's performed with a wide range of artists including Randy Brecker, Jon Faddis, Stanley Clarke, Robin Eubanks, Christian McBride, Frank Sinatra, Sammy Davis Jr., Ben Vereen, Tom Jones, Roger Daltrey, the Moody Blues, Natalie Cole, Mel Tormé; the Dallas, New Orleans, Honolulu, Nashville, Philadelphia, Buffalo, San Diego, and National Symphony orchestras; in ensembles with Doc Severinsen, Ron Carter, James Moody, Ernie Watts, Stevie Wonder; recorded for network TV/film, and played *The Tonight Show* and Golden Globe Awards. Marc has lectured and conducted clinics at countless universities in the U.S. and schools in England, Chile, Japan, South Korea, and Singapore, at international conferences (IAJE, JEN, & PASIC), and regional conferences (PMEA, NJMEA, CMS, Grammy in the Schools). He recently received Yamaha's prestigious Drumset Education Legacy Award, and was named Artist-in-Residence at Jefferson University Hospital's Health Design Lab to research neuroscience and drumming. He's a member of the PAS Scholarly Research Committee, and the board of the the National Jazz Festival, and teaches a summer graduate drum set course for K-12 educators at Villanova University. Marc's articles are published in leading magazines and journals, and his podcasts and interviews can be seen on numerous websites, including his own. He is an artist/clinician for Yamaha Drums, Zildjian Cymbals, Vic Firth Drumsticks, Remo Drumheads, and Latin Percussion.

K. Michelle Lewis Yeshima (they/them) is an educator and percussionist of 27 plus years and is currently self-employed at DrumSmart LLC where they provide group drumming opportunities in world music, professional development opportunities for music educators, and drum circle facilitation to support social-emotional learning. As a lifelong learner, Yeshima is pursuing a Ph.D. in Music Education from the University of Kentucky. Their research interests are the teacher's perceptions of a mindful-based social-emotional group drumming curriculum. Yeshima is a certified Remo Health Rhythms Facilitator, Beat the Odds Facilitator, Village Music Circles trainee, Tam Tam Mandingue Apprentice, World Music Drumming Level 1, World Music Pedagogy, Dalcroze Level 1, and has received their Orff Levels 1-3 at the University of Kentucky. A recent addition to the Percussive Arts Society Interactive Drum Committee, Yeshima is excited to share their talents as a researcher, author, and editor. In addition, they have been added to the Remo Health and Wellness Roster as a featured drum circle facilitator. Yeshima's "soul" purpose is to share the spirit of the drum by supporting colleagues around the world and sharing their innovative music lessons at music conferences, community events, and online. In addition, they are the host of the Power of Percussion Podcast where they explore the many facets of how percussion can be used to heal the body, mind, and spirit. Yeshima is a published author at F-flat Books and their articles can be found in *The Orff Echo*, *Percussive Notes*, and various music education journals. When Yeshima is not drumming, you can find them tending the forest with their cat Giovanni, staring at trees, or listening to nature's symphony of sound.

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Handedness: Are Drummers Right-handed or Left-handed? They're Neither and Both!

by Marc Dicciani

Abstract

Through long-standing customs and tradition, both cultural and musical, many drummers have come to believe that the instrument set-up and technique of playing the drum set is, in part, determined alone by the belief that we are right- or left-handed. In this paper, I will summarize some of those persisting opinions and how they've come about, and present information based on recent findings in medicine, genetics, neuroscience, and physiology that justify a deeper examination of many conventional practices and viewpoints. Much research, and numerous papers, studies, journals and books are cited, and comparisons are drawn with other professional disciplines that rely on similar motor skill development for learning, successful application, and execution. My paper contends that there are no right or wrong choices regarding the right/left crossed/open-handed, traditional/matched decisions we make, only that there are some that are bio-mechanically and neurologically more natural and which may aid in skill development and ultimately increase our facility and drumming vocabulary and options. Research in neuroplasticity, handedness, brain laterality, motor control, skill development, and approaches to human movement are complex, fascinating, ongoing, and dynamic. Understanding how these apply to many areas of drumming, the parallels between those and countless other fields and subjects, and how our bodies and nervous systems are connected with playing drums will allow us to make more informed choices about technique, learning protocols, playing methods, and equipment set-up.

Most of us drummers and percussionists are familiar with the history and development of the drum set as well as the numerous grip and hand, wrist, and arm movement techniques that have resulted over the years (see my recent article, *The Grip Debate*).¹ In this article I'm going to outline some issues that impact choices that we all make - or that have been made for us - about technique, practice, learning, and playing the drums. I also want to provide some important information relating to the latest research and findings in the areas of science, physiology, and medicine in order to position drumming in a larger context. From a very early age, through a combination of genetics, mirroring, culture, and

preference, most of us began to favor the use of one hand over the other for everyday tasks. This is often referred to as 'handedness'. Most people self-identify as being right- or left-handed depending on which hand they use to write. What seems like a relatively simple either/or determinant of handedness is actually not so simple, and in the case of drumming, may not be accurate or helpful, especially as it relates to equipment set-up, cross-over and open-handed playing, and even grip. It should be noted that there is a potential chicken-and-egg situation with skill and preference as it relates to drumming: does the preference exist because one hand is more skilled, or is that hand more skilled because it is the preferred hand and therefore used more frequent-

ly? It seems likely, though, that handedness is a result of a few factors rather than only an inborn skill difference.

Although there is no standard, empirical definition for measuring handedness, much research continues to attempt to define and quantify it. However, depending on which part of the world is surveyed and how it's measured, it is estimated that somewhere between 75% and 90% of the population in Western Countries prefer the use of the right hand over the left for executing certain tasks.^{2,3,4} Numerous online questionnaires claim to accurately measure your degree of handedness on a scale from strong left-, to mixed-, to strong right-handed. In these surveys, in addition to your preferred hand for writing, you're asked to indicate which hand you

always, or most often use to brush your teeth, hold a cup, throw a ball, open a jar or box, use scissors, etc. When completed, you're given a "Laterality Index" (LI) indicating where you land on the handedness scale.^{5,6}

Although it might be interesting to discover your 'score', it really should make no difference to how you learn, practice, play, and set-up the drums. A drum set is not a right or left-handed instrument, and it's best to approach it as a two-handed one where both hands are coordinated, and work together in tandem with the right and left foot.

In a paper in the *Journal of Motor Behavior*,⁷ the authors state...

The study of the neural control of voluntary movement has largely relied on an assessment of dominant (typically, right) arm function under a variety of task conditions, an approach that has led to the elucidation of some key motor control principles. However, the predominant emphasis on examining dominant arm performance has resulted in a somewhat erroneous view of motor control - that the control processes for non-dominant arm function are simply weaker analogues of those of the dominant arm. Over the past decade, our laboratories have collaboratively demonstrated that this is not the case.

Yes, we may feel more comfortable using one of our hands to write, draw, and use a spoon, but when we play drums we need both of our hands to be equally skilled and coordinated to satisfy the musical demands for fast, precise, and uncoupled movements. The same is true for timpanists, vibraphonists, congueros, and pianists, as well as surgeons, airline pilots, and athletes. Although some of these, and well as guitarists and violinists, employ differing skill sets in each hand, those skills are equally demanding and demonstrate the result of training and practice to reduce hand dominance asymmetry. This also applies to us in our everyday lives – we need both hands working together to drive a car, use a computer, and eat, even

if the skills for each hand are different.

The hands are our primary means of motor interaction with the environment. Their neural organization is fundamentally asymmetric, meaning both sides of the body work together and can perform separate tasks simultaneously. In playing the drums, as with most musical instruments, we are heavily reliant on the development of motor skills and neural pathways in order to physically play. The notion of independence, interdependence, and simply playing single strokes are examples of this asymmetry.

This also applies to the use of our feet. Whether we're playing rhythmic independence with the left foot on the high hat, clavé rhythms with our left foot using a bracket and a cow bell, or right and left foot double-bass drum patterns, we benefit by having both feet equally developed physiologically and neurologically, and perfectly coordinated with our hands.

We train our fingers, hands, and arms to work with our brains and nervous systems to enable us to achieve a level of control and fluency. The incredible physical dexterity, articulation, and timing that musicians are able to exact is aided, in part, by mechanoreceptors - neuroscientists' term for sense organs. The highest concentration of these sense organs are in our hands and fingers, clearly essential to drumming. Equally important to this discussion, this tactile acuity is the same in both hands.^{8,9,10,11}

The high concentration of these sensory receptors is what enables violinists, for example, to play the correct notes, in tune, with their left hand on a very small fretless fingerboard, accurately at breath-taking speed. This is no small feat considering that the vast majority of them are "right-handed" and they've learned to do this with their non-dominant hand.

According to Dr. Molly Gebrian, Professor at the University of Arizona, and professional violist and researcher with a background in neuroscience...

All bowed string players (unless they have

a severe abnormality on one side of their body) learn to play with the left hand fingering the instrument and the right arm in charge of bowing. It's irrelevant whether the student is right or left-handed. This is because the brain is highly plastic (changeable) and both the motor cortex (which controls voluntary movement) and the somatosensory cortex (which controls the perception of sensation from the body) change in response to how we use our bodies. In the brains of string players, for instance, the parts of the motor and somatosensory cortices that control the left-hand fingers are significantly bigger than the parts that control the right-hand fingers. This is true whether someone is right or left-handed and it has developed in response to training. These areas are also bigger than in non-musicians.¹²

Often, we drummers refer to the dominant hand as our strong hand and our non-dominant as weak. These designations are most likely faulty. As evidence, you need only watch skilled drummers play and, regardless of the grip or stick technique they use, or how they set up their instrument, try to determine their strong and weak hand. Even more illustrative of the difficulty of this task, try asking a non-drummer to make this distinction.

The degree of handedness (dominant vs. non-dominant) as it affects drumming is greatly altered through practice and training, and its neural basis changes over time. This means that how and what we do, and how we practice and play our instruments, produces dynamic changes to the cortex of the brain. Our brains and nervous systems adjust as a result of input in the form of practice.

Neuroplasticity can be viewed as a general umbrella term that refers to the brain's ability to modify, change, and adapt both structure and function throughout life and in response to experience.¹³

Due to preference and more frequent use of the dominant hand over the non-dominant hand in everyday life,

the non-dominant hand may be slightly weaker and less skilled when we first begin to play the drums. However, it can catch up very quickly and has the potential to become perfectly coordinated with, and equal to the dominant hand/arm through correct practice. For instance, when we first start to work on alternating singles, our dominant hand has better control and more strength. But, over time, the singles begin to even out. Eventually, and when practiced correctly, there is no discernible difference between the mobility of the hands, evenness of strokes, and the sound produced. Again, our brain and body respond and change according to input and practice.

Here's another example: if we've been playing a certain rhythm with our right hand for a number of years (let's say, the jazz ride cymbal pattern), and then we try to play the same rhythm with our left hand, we notice that it feels uncomfortable. This is not because our right hand has more innate fine motor control; it's because our sensorimotor systems and brains have developed that skill in a nuanced way through lots of playing.^{14,15}

In fact, if you watch experienced jazz drummers playing jazz time on the ride with the 'dominant' RH, you'll notice that the 'non-dominant' LH is playing intricate, continuously changing, shaded rhythms on the snare, toms, etc., often executing more difficult and precise work than the 'strong' hand.

Ironically, if we consider handedness as an important issue in how we approach playing, we actually may be able to progress faster by reversing the roles of our hands. In other words, the more dynamic, changing, nuanced rhythmic elements could, perhaps be more quickly learned and played by the dominant RH, while using the non-dominant LH for the less-changing, less-active elements (jazz time, straight 8ths, etc).

Consider this: let's say we're 'right-handed' and playing a funk pattern. The right hand plays 8th notes on the high hat or ride cymbal and the left hand plays 2 & 4 along with some ghost notes on the snare.

If we try the same pattern but switch the rhythmic roles to the opposite hand, we'll notice that our right hand does not have the same degree of control of those ghost notes as our left hand. In addition, the left (non-dominant) hand feels awkward even though it may be playing straight 8th notes. If our dominant hand holds all of the fine motor skills this switch should present no problem. So why does it not sound or feel as good? Simply, our brain responds to input, and the techniques we've used to play that pattern through years of repetition are deeply ingrained in our sensorimotor systems.¹⁶

Of course, we could re-learn that pattern by switching hands, but what would be the point of doing that? That neural memory has developed in us through time and practice, so the benefits of changing course are, debatably, slim to none.

The bottom line here is that our hands become very skilled through consistent practice because our brains respond to input.^{17,18,19,20} There are multiple learning styles and how we learn and which of these we use depends a great deal on what we're learning. We can have multiple learning styles and even use aspects of all of them, but for the most part we are visual.^{21, 22, 23}

Seeing primes the body for doing, which is one reason so many beginners, and even non-drummers, assume that crossing the RH over the LH to play on the high hat is the correct way. This is a form of visual learning by imitation.²⁴ Although we've adapted and made that work, it is neither correct nor incorrect, but rather just one way to play.

We all know that many techniques drummers use and have used over the years have been handed down over many decades. Some of these techniques are typically not the result of research into how our bodies actually move and how our brains and nervous systems work. Most of us have learned through observing, or being told, that if we're 'right-handed', that's the hand that should be playing on the high hat by crossing

over the left hand playing on the snare. Many of us have done this without question for decades, thereby creating a few unnecessary challenges for ourselves by believing that this cross-handed method of playing is the 'correct way' instead of it being 'one way' to play. If we've been crossing the right hand over the left to play on the high hat we can continue to do that. If we don't encounter problems and if we feel comfortable and uncompromised playing that way, there is no need to change. However, if we want to experiment with some new patterns playing open-handed with the left hand on the high hat (or any sound on the left side of the kit) while moving the right hand freely around the right side of the kit, then we should practice and develop them that way. Whichever technique we decide to use (crossed or open-handed), it should be determined by how and what we want to play, and not because we think that we're right or left handed.

Related to handedness is the concept that a drum kit should be set up differently for a 'left-handed' person. If you've set up this way for your entire career, then keep playing that way. However, given the ideas presented above, it is my belief that beginners not arrange a drum kit differently on the basis of perceived hand dominance. Pianos, vibraphones, timpani, saxophones, violins, etc. are not designed differently for 'righties' and 'lefties' - they don't need to be, nor does a drum kit. Adapting, adjusting, learning, and enjoying playing the drums is within everyone's reach regardless of which hand you write your name with. Renowned vibraphonist Tony Micelli states that whether playing with two or four mallets,

Our hands assume roles because of the layout of the instrument, it doesn't matter if we think we're right- or left-handed, our hands must be equally skilled.

Eight-time Grammy nominee as a leader, famed Latin and Jazz drummer, percussionist Bobby Sanabria states that...

Regardless of which hand might be your dominant hand, in order to play drums, congas, timbales, bongos, vibes, marimba, timpani, and any type of percussion at a high level, you can't have a weak hand. You need to have them both functioning pretty much evenly. And if you're talking specifically about the drum set? That means your feet as well. With that in mind, a good piece of advice, and I'm serious, is learn how to dance.

Don Liuzzi, principal timpanist with the Philadelphia Orchestra, considers the timpani...

To be a 2-handed instrument that requires both hands to be highly skilled.

Professor Liuzzi is a right-handed person who has trained his left hand to do more work, in part by using the American system with the low drum on left side thereby forcing the left hand to play stronger on the low drum.

I also encourage my students to practice at the drum set placing the ride cymbal on left side and practicing "riding" with the left hand, developing better dexterity.

Due to an injury, Don had to quickly incorporate an amended technical grip for a few months, creating a new neural pathway. It is a grip he still occasionally uses, enabling him to continue to perform at a high level.

Personally, I have 40+ years of playing the high hat mostly with my right hand, and it could take years for me to develop the same feel and comfort by switching. However, I do practice new rhythmic patterns and even some common grooves open-handed if this allows my right hand to move more freely around the drums. There are no physiological or neurological reasons stopping or inhibiting any of us from trying new techniques, and unfamiliarity with a different way of playing can be expected.

As I mentioned earlier, the science of neuroplasticity is a fact - the brain is 'plas-

tic' and mutable, and it changes based on what we do, think, intensely experience, learn, study, and practice. Dr. Trisha Stratford, a clinical neuro-psychotherapist, author, and university lecturer, states that it can take, on average, 8 weeks to begin to develop a new neural pathway (a way of playing something new).²⁵ However, in some cases, depending on the complexity of the activity, it can take three or more months for a new brain map, equal in complexity to an old one, to be created in the motor cortex.

If you do develop a new neural memory (sometimes called muscle memory), it doesn't negate the other pathways. In fact, learning something new is aided by what you've already learned and will make the new learning quicker. Skill learning consists not only of the learning process itself, but also the ability to transfer what has been learned to new conditions and task variants (savings of learning). This is sometimes called "transfer of learning."²⁶ There is also growing evidence that both sides of the brain work hard to learn the rhythms and 'roles' designed and intended for the opposite hand, even if you rarely play it that way. All those years of practicing something with one of your hands has actually inadvertently transferred some, or much, of that 'vocabulary', or skill to the other hand automatically.^{27, 28, 29}

Given all of this, I believe that the drum set is neither a right or left-handed instrument and the learning, practice, performance, and set-up reflect that in order to maximize development. A little bit of research, questioning, and fact-finding will help us all separate fact from fiction and enable more informed choices about technique, learning, playing methods, and equipment set-up. Handedness, motor control, skill development, and computational and experimental approaches to human movement are complex and intriguing issues, as well fascinating areas of research which remain ongoing and dynamic.

Neuroscientists, psychologists, geneti-

cists, medical professionals and others including *Jorn Diedrichssen, PhD.*, Western Research Chair for Motor Control and Computational Neuroscience, University of Western Ontario, *Daniel Wolpert, PhD.*, Professor of Neuroscience and member of the Zuckerman Mind Brain and Behavior Institute at Columbia University, and *Dr. John Krakauer*, Professor of Neurology and Neuroscience, and Director of the Center for the Study of Motor Learning and Brain Repair at Johns Hopkins are among the leaders in these areas. Although the full story continues to unravel, much is already known and we can use that to our advantage as players and teachers as we develop, think, question, and learn throughout our lifetimes.

REFERENCES

- Anguera, Joaquin A., Colleen A. Russell, Douglas C. Noll, and Rachael D. Seidler. "Neural Correlates Associated with Intermanual Transfer of Sensorimotor Adaptation." *Brain Research* 1185 (2007): 136–51. <https://doi.org/10.1016/j.brainres.2007.09.088>
- Bradford, William C., *Reaching the Visual Learner: Teaching Property Through Art* (September 1, 2011). *The Law Teacher* Vol. 11, 2004, Available at SSRN: <https://ssrn.com/abstract=587201>
- Dicciani, Marc. "The Grip Debate: Traditional, Matched, and Countless Variations of Holding and Moving the Sticks." *Percussive Notes*, June 2022. http://www.dicciani.com/materials/Marc_Dicciani_article_The_Grip_Debate_Traditional_Grip_Or_Matched_Grip_Which_Is_Better.pdf
- Diedrichsen, Jörn., Wiestler Tobias, Waters-Metenier Sheena., *Effector-Independent Motor Sequence Representations Exist in Extrinsic and Intrinsic Reference Frames*. April 2014. *Journal of Neuroscience*, 34 (14) 5054-5064; DOI: 10.1523/JNEUROSCI.5363-13.2014
- Diedrichssen, Jörn., Western Research Chair for Motor Control and Computational Neuroscience, University of Western Ontario
- Gebrian, Molly. March 2021, personal interview quote
- Higgins, Susan. "Motor Skill Acquisition." February 1991, *American Physical Thera-*

- py Association 71(2):123-39. doi: 10.1093/ptj/71.2.123. PMID: 1989008.
- Holder, M K. "Why Are More People Right-Handed?" *Scientific American*, November 1, 2001. <https://www.scientificamerican.com/article/why-are-more-people-right/>.
- Huber, Meghan E., Nikita Kuznetsov, and Dagmar Sternad. "Persistence of Reduced Neuromotor Noise in Long-Term Motor Skill Learning." *Journal of Neurophysiology* 116, no. 6 (2016): 2922-35. <https://doi.org/10.1152/jn.00263.2016>.
- Huberdeau, David M., Krakauer, John W., and Haith, Adrian M. "Practice Induces a Qualitative Change in the Memory Representation for Visuomotor Learning." *Journal of Neurophysiology* 122, no. 3 (2019): 1050-59. <https://doi.org/10.1152/jn.00830.2018>.
- Jań ncke L., Schlaug Gottfried., Steinmetz H. "Hand Skill Asymmetry in Professional." 1994 *Musicians Brain and Cognition* 34, 424-432 (1997) Article # BR970922)
- Jawed, Soyiba, Hafeez Ullah Amin, Aamir Saeed Malik, and Ibrahim Faye. "Classification of Visual and Non-Visual Learners Using Electroencephalographic Alpha and Gamma Activities." *Frontiers in Behavioral Neuroscience* 13 (2019). <https://doi.org/10.3389/fnbeh.2019.00086>.
- Krakauer, John. Professor of Neurology and Neuroscience, and Director of the Center for the Study of Motor Learning and Brain Repair at Johns Hopkins University
- Liuzzi, Don. principal timpanist, Philadelphia Orchestra, faculty at Curtis Institute of Music, personal interview quote
- Lopes, M.C., and J. Santos-Victor. "Visual Learning by Imitation with Motor Representations." *IEEE Transactions on Systems, Man and Cybernetics, Part B (Cybernetics)* 35, no. 3 (2005): 438-49. <https://doi.org/10.1109/tsmcb.2005.846654>.
- Merrett, Rebecca. "A Neuroscience Approach to Innovative Thinking and Problem Solving." *CIO*, July 27, 2015. <https://www2.cio.com.au/article/580509/neuroscience-approach-innovative-thinking-problem-solving/>.
- Micelli, Tony. Professor of Vibraphone, The University of the Arts, and jazz vibraphonist, personal interview quote
- Mutha, Pratik K., Kathleen Y. Haaland, and Robert L. Sainburg. "The Effects of Brain Lateralization on Motor Control and Adaptation." *Journal of Motor Behavior* 44, no. 6 (2012): 455-69. <https://doi.org/10.1080/00222895.2012.747482>.
- Négyesi, János, Péter Négyesi, Tibor Hortobágyi, Sai Sun, Joji Kusuyama, Rita M. Kiss, and Ryoichi Nagatomi. "Handedness Did Not Affect Motor Skill Acquisition by the Dominant Hand or Interlimb Transfer to the Non-Dominant Hand Regardless of Task Complexity Level." *Scientific Reports* 12, no. 1 (2022). <https://doi.org/10.1038/s41598-022-21962-2>.
- Perelle, I B, and L Ehrman. "Behavior Genetics Association Abstracts." *Behavior Genetics* 24, no. 3 (1994): 217-27. <https://doi.org/10.1007/bf01071565>.
- Peters, Ryan M., Erik Hackeman, and Daniel Goldreich. "Diminutive Digits Discern Delicate Details: Fingertip Size and the Sex Difference in Tactile Spatial Acuity." *The Journal of Neuroscience* 29, no. 50 (2009): 15756-61. <https://doi.org/10.1523/jneurosci.3684-09.2009>.
- Purves D, Augustine GJ, Fitzpatrick D, et al., editors. *Mechanoreceptors Specialized to Receive Tactile Information*. 2001 Neuroscience, 2nd edition. Sunderland (MA): Sinauer Associates
- Sanabria, Bobby. Latin and Jazz drummer and percussionist, personal interview quote
- Schlaug G., Jań ncke L., Huang Y., Steinmetz H. *In Vivo Evidence of Structural Brain Asymmetry in Musicians*. 1995, *Science*, 267, 699-701
- Schlaug, Gottfried. "The Brain of Musicians." *Annals of the New York Academy of Sciences* 930, no. 1 (2001): 281-99. <https://doi.org/10.1111/j.1749-6632.2001.tb05739.x>.
- Schonbrun, Zach. "Searching for the Motor Engram." Essay. In *The Performance Cortex: How Neuroscience Is Redefining Athletic Genius*, 215. New York, NY: Dutton, 2019.
- Seghier, Mohamed L. "Laterality Index in Functional MRI: Methodological Issues." *Magnetic Resonance Imaging* 26, no. 5 (2008): 594-601. <https://doi.org/10.1016/j.mri.2007.10.010>.
- Seidler, Rachael D. "Neural Correlates of Motor Learning, Transfer of Learning, and Learning to Learn." *Exercise and Sport Sciences Reviews* 38, no. 1 (2010): 3-9. <https://doi.org/10.1097/jes.0b013e3181c5cce7>.
- Shmerling, Robert H. "Right Brain/Left Brain, Right?" *Harvard Health*, March 24, 2022. <https://www.health.harvard.edu/blog/right-brainleft-brain-right-2017082512222>.
- Shmuelof, Lior, John W. Krakauer, and Pietro Mazzoni. "How Is a Motor Skill Learned? Change and Invariance at the Levels of Task Success and Trajectory Control." *Journal of Neurophysiology* 108, no. 2 (2012): 578-94. <https://doi.org/10.1152/jn.00856.2011>.
- Vega-Bermudez, Francisco, and Kenneth O. Johnson. "Differences in Spatial Acuity Between Digits." *Neurology* 56, no. 10 (2001): 1389-91. <https://doi.org/10.1212/wnl.56.10.1389>.
- Verdino, Michele, and Sherry Dingman. "Two Measures of Laterality in Handedness: The Edinburgh Handedness Inventory and the Purdue Pegboard Test of Manual Dexterity." *Perceptual and Motor Skills* 86, no. 2 (1998): 476-78. <https://doi.org/10.2466/pms.1998.86.2.476>.
- Voss, Patrice, Maryse E. Thomas, J. Miguel Cisneros-Franco, and Étienne de Villers-Sidani. "Dynamic Brains and the Changing Rules of Neuroplasticity: Implications for Learning and Recovery." *Frontiers in Psychology* 8 (2017). <https://doi.org/10.3389/fpsyg.2017.01657>.
- Wiestler, Tobias, Sheena Waters-Metenier, and Jörn Diedrichsen. "Effector-Independent Motor Sequence Representations Exist in Extrinsic and Intrinsic Reference Frames." *The Journal of Neuroscience* 34, no. 14 (2014): 5054-64. <https://doi.org/10.1523/jneurosci.5363-13.2014>.
- Wolpert, D. PhD., Professor of Neuroscience and member of the Zuckerman Mind Brain and Behavior Institute at Columbia University
- Zopf, Regine, Claire Marie Giabbiconi, Thomas Gruber, and Matthias M Müller. "Attentional Modulation of the Human Somatosensory Evoked Potential in a Trial-by-Trial Spatial Cueing and Sustained Spatial Attention Task Measured with High Density 128 Channels EEG." *Cognitive Brain Research* 20, no. 3 (2004): 491-509. <https://doi.org/10.1016/j.cogbrainres.2004.02.014>.

END NOTES

- Marc Dicciani. "The Grip Debate: Traditional, Matched, and Countless Variations of Holding and Moving the Sticks." *Percussive Notes*, June 2022, <http://www.dicciani.com/materials/>
- M K Holder, "Why Are More People Right-Handed?" *Scientific American*, November 1, 2001. <https://www.scientificamerican.com/article/why-are-more-people-right/>.
- Robert H. Shmerling, "Right Brain/Left Brain, Right?" *Harvard Health*, March 24, 2022. <https://www.health.harvard.edu/blog/right-brainleft-brain-right-2017082512222>.
- I B Perelle, Lee Ehrman, "Behavior Genetics Association Abstracts." *Behavior Genetics* 24, no. 3 (1994): 217–27. <https://doi.org/10.1007/bf01071565>.
- Michele Verdino, and Sherry Dingman, "Two Measures of Laterality in Handedness: The Edinburgh Handedness Inventory and the Purdue Pegboard Test of Manual Dexterity." *Perceptual and Motor Skills* 86, no. 2 (1998): 476–78. <https://doi.org/10.2466/pms.1998.86.2.476>.
- Mohamed L Seghier, "Laterality Index in Functional MRI: Methodological Issues." *Magnetic Resonance Imaging* 26, no. 5 (2008): 594–601. <https://doi.org/10.1016/j.mri.2007.10.010>.
- Pratik K. Mutha, Kathleen Y. Haaland, and Robert L. Sainburg, "The Effects of Brain Lateralization on Motor Control and Adaptation." *Journal of Motor Behavior* 44, no. 6 (2012): 455–69. <https://doi.org/10.1080/0022895.2012.747482>.
- Dale Purves, George Augustine, David Fitzpatrick, et al., "Mechanoreceptors Specialized to Receive Tactile Information" *Neuroscience*. 2nd edition. Sunderland (MA): Sinauer Associates; 2001. <https://www.ncbi.nlm.nih.gov/books/NBK10895/>
- Zach Schonbrun, "Searching for the Motor Engram." *The Performance Cortex: How Neuroscience Is Redefining Athletic Genius*, 215. New York, NY: Dutton, 2019.
- Ryan M. Peters, Erik Hackeman, and Daniel Goldreich. "Diminutive Digits Discern Delicate Details: Fingertip Size and the Sex Difference in Tactile Spatial Acuity." *The Journal of Neuroscience* 29, no. 50 (2009): 15756–61. <https://doi.org/10.1523/jneurosci.3684-09.2009>.
- Francisco Vega-Bermudez, and Kenneth O. Johnson. "Differences in Spatial Acuity Between Digits." *Neurology* 56, no. 10 (2001): 1389–91. <https://doi.org/10.1212/wnl.56.10.1389>.
- Molly Gebrian, interview, written submitted quote, March 2021
- Patrice Voss, Maryse E. Thomas, J. Miguel Cisneros-Franco, and Étienne de Villers-Sidani. "Dynamic Brains and the Changing Rules of Neuroplasticity: Implications for Learning and Recovery." *Frontiers in Psychology* 8 (2017). <https://doi.org/10.3389/fpsyg.2017.01657>.
- Patrice Négyesi, Péter Négyesi, Tibor Hortobágyi, Sai Sun, Joji Kusuyama, Rita M. Kiss, and Ryoichi Nagatomi. "Handedness Did Not Affect Motor Skill Acquisition by the Dominant Hand or Interlimb Transfer to the Non-Dominant Hand Regardless of Task Complexity Level." *Scientific Reports* 12, no. 1 (2022). <https://doi.org/10.1038/s41598-022-21962-2>.
- Gottfried Schlaug, "The Brain of Musicians." *Annals of the New York Academy of Sciences* 930, no. 1 (2001): 281–99. <https://doi.org/10.1111/j.1749-6632.2001.tb05739.x>.
- Susan Higgins, "Motor Skill Acquisition." *Physical Therapy*, Volume 71, Issue 2, 1 February 1991, Pages 123–139, <https://doi.org/10.1093/ptj/71.2.123>
- Lior Shmuelof, John W. Krakauer, and Pietro Mazzoni, "How Is a Motor Skill Learned? Change and Invariance at the Levels of Task Success and Trajectory Control." *Journal of Neurophysiology* 108, no. 2 (2012): 578–94. <https://doi.org/10.1152/jn.00856.2011>.
- Gottfried Schlaug, "The Brain of Musicians." *Annals of the New York Academy of Sciences* 930, no. 1 (2001): 281–99. <https://doi.org/10.1111/j.1749-6632.2001.tb05739.x>.
- Meghan E., Huber, Nikita Kuznetsov, and Dagmar Sternad, "Persistence of Reduced Neuromotor Noise in Long-Term Motor Skill Learning." *Journal of Neurophysiology* 116, no. 6 (2016): 2922–35. <https://doi.org/10.1152/jn.00263.2016>.
- David M. Huberdeau, John W. Krakauer, and Adrian M. Haith, "Practice Induces a Qualitative Change in the Memory Representation for Visuomotor Learning." *Journal of Neurophysiology* 122, no. 3 (2019): 1050–59. <https://doi.org/10.1152/jn.00830.2018>.
- William C. Bradford, "Reaching the Visual Learner: Teaching Property Through Art" *The Law Teacher* Vol. 11, 2004, <https://ssrn.com/abstract=587201>
- Soyiba Jawed, Ullah Amin Hafeez, Aamir Saeed Malik, and Ibrahim Faye, "Classification of Visual and Non-Visual Learners Using Electroencephalographic Alpha and Gamma Activities." *Frontiers in Behavioral Neuroscience* 13 (2019). <https://doi.org/10.3389/fnbeh.2019.00086>.
- Regine Zopf, Claire Marie Giabbiconi, Thomas Gruber, and Matthias M Müller. "Attentional Modulation of the Human Somatosensory Evoked Potential in a Trial-by-Trial Spatial Cueing and Sustained Spatial Attention Task Measured with High Density 128 Channels EEG." *Cognitive Brain Research* 20, no. 3 (2004): 491–509. <https://doi.org/10.1016/j.cogbrainres.2004.02.014>.
- Lopes, M., and J. Santos-Victor, "Visual Learning by Imitation with Motor Representations." *IEEE Transactions on Systems, Man and Cybernetics, Part B (Cybernetics)* 35, no. 3 (2005): 438–49. <https://doi.org/10.1109/tsmcb.2005.846654>.
- Rebecca Merrett, "A Neuroscience Approach to Innovative Thinking and Problem Solving." *CIO*, July 27, 2015. <https://www2.cio.com.au/article/580509/neuroscience-approach-innovative-thinking-problem-solving/>
- Rachael D Seidler, "Neural Correlates of Motor Learning, Transfer of Learning, and Learning to Learn." *Exercise and Sport Sciences Reviews* 38, no. 1 (2010): 3–9. <https://doi.org/10.1097/jes.0b013e3181c5cce7>.
- Tobias Wiestler, Sheena Waters-Metenier, and Jörn Diedrichsen, "Effector-Independent Motor Sequence Representations Exist in Extrinsic and Intrinsic Reference Frames." *The Journal of Neuroscience* 34, no. 14 (2014): 5054–64. <https://doi.org/10.1523/jneurosci.5363-13.2014>.
- Pratik K. Mutha, Kathleen Y. Haaland, and Robert L. Sainburg, "The Effects of Brain Lateralization on Motor Control and Adaptation." *Journal of Motor Behavior* 44, no. 6

(2012): 455–69. <https://doi.org/10.1080/00222895.2012.747482>.

29. Joaquin A. Anguera, Colleen A. Russell, Douglas C. Noll, and Rachael D. Seidler, “Neural Correlates Associated with Intermanual Transfer of Sensorimotor Adaptation.” *Brain Research* 1185 (2007): 136–51. <https://doi.org/10.1016/j.brainres.2007.09.088>.

BIBLIOGRAPHY

Altenmüller, Eckart, Stanley Finger, and François Boller. “Music, Neurology, and Neuroscience: Evolution, the Musical Brain, Medical Conditions, and Therapies.” Amsterdam, Netherlands: Elsevier, 2015.

Anderson, John R. “Cognitive Skills and Their Acquisition.” London: Taylor and Francis, 2013. ISBN 9780898590937

Andreasen, Nancy. “Secrets of the Creative Brain.” *The Atlantic*. July/August 2014. <https://www.theatlantic.com/magazine/archive/2014/07/secrets-of-the-creative-brain/372299/>

Brown, Roediger McDaniel. “Make it Stick.” Brown, Roediger, McDaniel, 2014. ISBN 9780674729018

Brown, Steven, and Lawrence M Parsons. “The Neuroscience of Dance.” *Scientific American* vol. 299,1 (2008): 78–83. doi:10.1038/scientificamerican0708-78

Cappuccio, Massimiliano. “When Embodied Cognition and Sport Psychology Team-up.” *Phenomenology and the Cognitive Sciences*. 14, 213–225. 2015. <https://doi.org/10.1007/s11097-015-9415-1>

Carey, Benedict. “How We Learn.” Random House, 2014. 9780812993882. ISBN10: 0812993888

Chisnall, Robert. “A Brief History of Handedness Research.” *Handedness: Theories, Genetics and Psychology* (pp. 45–68). 2012. Nova Science Publishers.

Costandi, Moheb. “Neuroplasticity.” MIT Press. 2016. ISBN: 9780262529334

Dayan, Eran, and Leonardo G Cohen. “Neuroplasticity Subservicing Motor Skill Learning.” *Neuron* vol. 72,3 (2011): 443–54. doi:10.1016/j.neuron.2011.10.008

Davies, Hugh. “Left, Right or Wrong?” *The Musical Times* 120, no. 1633 (1979): 197. <https://doi.org/10.2307/961744>.

de Boer, Bettenco J., C. (Lieke) Peper, and Peter J. Beek. “Development of Temporal and Spatial Bimanual Coordination during Childhood.” *Motor Control* 16, no. 4 (2012): 537–59. <https://doi.org/10.1123/mcj.16.4.537>.

de Kleine, Elian, and Verwey, Willem B., “Effects of Hand Used and Hand Position in the Discrete Sequence Production Task.” *PsycEXTRA Dataset*, 2008. <https://doi.org/10.1037/e527312012-263>.

Diedrichsen, J., (Diedrichsen’s Lab) “Interaction of Multiple Future Movement Plans in Sequential Reaching.” May 2023. DOI:10.111/2023.05.24.542099

Diedrichsen, J., Shadmehr, R., & Ivry, R. B. (2010). “The Coordination of Movement: Optimal Feedback Control and Beyond.” *Trends in Cognitive Sciences*, 14(1), 31–39. <https://doi.org/10.1016/j.tics.2009.11.004>

Doidge, Norman. “The Brain That Changes Itself: Stories of Personal Triumph from the Frontiers of Brain Science.” Strawberry Hills, NSW: ReadHowYouWant, 2017. ISBN: 978-0143113102

Dunham, James, and Todd Davenport. “Handedness Theories, Genetics and Psychology.” Hauppauge, NY: Nova Science Publishers, 2012.

Ericsson, Anders, and Robert Pool. *Peak: Secrets from the New Science of Expertise*. Boston: Mariner Books/Houghton Mifflin Harcourt, 2017.

Fitton, Isabel, Christopher Clarke, Jeremy Dalton, Michael J Proulx, and Christof Lutteroth. “Dancing with the Avatars: Minimal Avatar Customisation Enhances Learning in a Psychomotor Task.” *Proceedings of the 2023 CHI Conference on Human Factors in Computing Systems*, 2023. <https://doi.org/10.1145/3544548.3580944>.

Fujii Shinya, Masaya Hirashima, Kazutoshi Kudo, Tatsuyuki Ohtsuki, Yoshihiko Nakamura, and Shingo Oda. “Synchronization Error of Drum Kit Playing with a Metronome at Different Tempi by Professional Drummers.” *Music Perception* 28, no. 5 (2011): 491–503. <https://doi.org/10.1525/mp.2011.28.5.491>.

Geake, John. “Neuromythologies in Education.” *Educational Research* 50, no. 2 (2008): 123–33. <https://doi.org/10.1080/00131880802082518>.

Gainotti, Guido. “The Influence of Handedness on Hemispheric Representation of Tools: A Survey.” *Brain and Cognition* 94 (2015): 10–16. <https://doi.org/10.1016/j.bandc.2014.12.005>.

Gould, Elizabeth. “How Does Experience Influence the Brain?” (video) <https://www.youtube.com/watch?v=N-txqhxv01Q>

Gould, Elizabeth, and Laham, Blake, “Plasticity in the Adult Brain.” *Encyclopedia of Behavioral Neuroscience: Second Edition* (2021, Vol. 1-3, pp. 65-70). Elsevier. <https://doi.org/10.1016/B978-0-12-819641-0.00015-3>

Grahn, Jessica A. “Neural Mechanisms of Rhythm Perception: Current Findings and Future Perspectives.” *Topics in Cognitive Science* 4, no. 4 (2012): 585–606. <https://doi.org/10.1111/j.1756-8765.2012.01213.x>.

Habermeyer, Benedikt, Marcus Herdener, Fabrizio Esposito, Caroline C. Hilti, Markus Klarhöfer, Francesco di Salle, Stephan Wetzel, Klaus Scheffler, Katja Cattapan-Ludewig, and Erich Seifritz. “Neural Correlates of Preattentive Processing of Pattern Deviance in Professional Musicians.” *Human Brain Mapping* 30, no. 11 (2009): 3736–47. <https://doi.org/10.1002/hbm.20802>.

Herholz, Sibylle C., and Robert J. Zatorre. “Musical Training as a Framework for Brain Plasticity: Behavior, Function, and Structure.” *Neuron* 76, no. 3 (2012): 486–502. <https://doi.org/10.1016/j.neuron.2012.10.011>.

Hossner, E-J, Schieb, F., Göhner, U. “A Functional Approach to Movement Analysis and Error Identification in Sports and Physical Education.” *Frontiers in Psychology*. Sec. Movement Science Volume 6 - 2015 <https://doi.org/10.3389/fpsyg.2015.01339>

Huberdeau, David M., John W. Krakauer, and Adrian M. Haith. “Practice Induces a Qualitative Change in the Memory Representation for Visuomotor Learning.” *Journal of Neurophysiology* 122, no. 3 (2019): 1050–59. <https://doi.org/10.1152/jn.00830.2018>.

Huberman, A., podcasts and YouTube interviews

Jones, L. “Procedural and Declarative Memory Practice - A Guitarist’s Perspective” <https://www.linkedin.com/pulse/procedur->

- al-declarative-memory-practice-guitarists-lee-jones/
- Kaufman, Scott Barry et al. "Implicit Learning as an Ability." *Cognition* vol. 116,3 (2010): 321- 40. doi:10.1016/j.cognition.2010.05.011
- Kilteni, Konstantina et al. "Drumming In Immersive Virtual Reality: The Body Shapes the Way We Play." *IEEE transactions on visualization and computer graphics* vol. 19,4 (2013): 597-605. doi:10.1109/TVCG.2013.29
- Kopiez, R., et al. "No Disadvantage for Left-handed Musicians: The Relationship Between Handedness, Perceived Constraints and Performance-related Skills in String Players and Pianists." *Psychology of Music*, 40(3), 357–384. <https://doi.org/10.1177/0305735610394708>
- Kornysheva, Katja, and Ricarda I. Schubotz. "Impairment of Auditory-Motor Timing and Compensatory Reorganization after Ventral Premotor Cortex Stimulation." *PLoS ONE* 6, no. 6 (2011): e21421. doi:10.1371/JOURNAL.PONE.0021421.
- Kotz, S A, et al. "The Evolution of Rhythm Processing." *Trends in Cognitive Sciences* vol. 22,10 (2018): 896-910. doi:10.1016/j.tics.2018.08.002
- Krakauer, J., and Stanley, J. "Motor Skill Depends on Knowledge of Facts." *Frontiers in Human Neuroscience*, August 2013,7 (503):503. 10.3389/fnhum.2013.00503
- Krakauer, J. "The Intelligence of Movement" (video) <https://www.youtube.com/watch?v=Zh6F44grke0>
- "Laterality: Asymmetries of Body, Brain and Cognition." Volume 9, 2004, Author Index. *Laterality: Asymmetries of Body, Brain and Cognition* 9, no. 4 (2004): 1–2. <https://doi.org/10.1080/714464350>.
- Lems, Kristin. "Music, Our Human Superpower." *Academia Letters*, 2021. doi:10.20935/AL304.
- Lohr, J., "Can Visualizing Your Body Doing Something Help You Learn to Do It Better?" *Scientific American*, May 2015. <https://www.scientificamerican.com/article/can-visualizing-your-body-doing-something-help-you-learn-to-do-it-better/>
- MacNamara, Á., Holmes, P., & Collins, D. "Negotiating Transitions in Musical Development: The Role of Psychological Characteristics of Developing Excellence." *Psychology of Music*, 36(3), 335-352. <https://doi.org/10.1177/0305735607086041>
- Mastin, L. "Right, Left, Right, Wrong: An Investigation of Handedness" <https://www.rightleftwrong.com/>
- McGuiness, Andy. "Groove Microtiming Deviations as Phase Shifts." 9th International Conference on Music Perception and ..., 2006.
- Metcalfe, C. D., Irvine, T. A., Sims, J. L., Wang, Y. L., Su, A. W., & Norris, D. O. (2014). "Complex Hand Dexterity: A Review of Biomechanical Methods for Measuring Musical Performance." *Frontiers in Psychology*, 5, 414. <https://doi.org/10.3389/fpsyg.2014.00414>
- Morrow, M., "Music as Medicine and The Science of How Our Bodies Need Rhythm" <https://www.youtube.com/watch?v=ko-evFKL7pf0>
- Muscolino, J., "Body Mechanics" <https://learn-muscles.com/product/body-mechanics-for-manual-therapy-neck-and-back-treatment/>
- Mutha, P. K., Haaland, K. Y., & Sainburg, R. L. "The Effects of Brain Lateralization on Motor Control and Adaptation." *Journal of Motor Behavior*, 44(6), 455–469. 2012<https://doi.org/10.1080/00222895.2012.747482>
- Norton, Andrea., et al. "Are There Pre-existing Neural, Cognitive, or Motoric Markers for Musical Ability?" *Brain and Cognition* vol. 59,2 (2005): 124-34. doi:10.1016/j.bandc.2005.05.009
- O'Connor, Eddie. "The Psychology of Performance." Chantilly, VA: Teaching Company, 2017. ASIN: B0758MHNS6
- Papadatou-Pastou M. (2018). "Handedness and Cognitive Ability: Using Meta-analysis to Make Sense of the Data." *Progress in Brain Research*, 238, 179–206. <https://doi.org/10.1016/bs.pbr.2018.06.008>
- Pasupathi, M., "How We Learn." Random House, 2014. ISBN: 978-0812984293
- Patel, A. D. "Music, Language, and the Brain." Oxford University Press, 2008. ISBN: 9780195123753
- Pellicano, A., et al. "Real-life Motor Training Modifies Spatial Performance: The Advantage of Being Drummers." *The American Journal of Psychology* vol. 123,2 (2010): 169-79. doi:10.5406/amerjpsyc.123.2.0169
- Phillips-Silver, J., & Trainor, L. J. "Vestibular Influence on Auditory Metrical Interpretation." *Brain and cognition*. 2008. 67(1), 94–102. <https://doi.org/10.1016/j.bandc.2007.11.007>
- Polk, T., "The Learning Brain." *The Great Courses*, 2018 Rocchesso, Davide. "Beat Fusion in the Brain of a Drummer: Expertise Alters Audiovisual Brain Activation." *Academia.edu*, October 10, 2015. https://www.academia.edu/16621102/Beat_Fusion_in_the_Brain_of_a_Drummer_Expertise_alters_audiovisual_brain_activation.
- Pontillo, T. "Spatial Ability and Handedness as Potential Predictors of Space Teleoperation Performance." PhD diss., Massachusetts Institute of Technology, 2010.
- Popp, N., Hernandez-Castillo, C., Gribble, P., and Diedrichsen, J. "The Role of Feedback in the Production of Skilled Finger Sequences." *Journal of Neurophysiology* 127, no. 4 (2022): 829-839.
- Popp, N.J., Yokoi, A., Gribble, P.L. and Diedrichsen, J., 2020. "The Effect of Instruction on Motor Skill Learning." *Journal of Neurophysiology*, 124(5), pp.1449-1457.
- Prieur, J., Barbu, S. and Blois-Heulin, C., 2017. "Assessment and Analysis of Human Laterality for Manipulation and Communication Using the Rennes Laterality Questionnaire." *Royal Society Open Science*, 4(8), p.170035.
- Ratey, John. "A User's Guide to the Brain." Abacus, 2009. ISBN: 9780679453093
- Rozen, S. "Left Brain vs. Right Brain: Fact or Fiction?" *Atlassian Intelligence*, 2023 <https://www.atlassian.com/blog/productivity/left-brain-vs-right-brain>
- Sainburg, S., and Schaefer, S. "Interlimb Differences in Control of Movement Extent." *Journal of Neurophysiology* 92, no. 3 (2004): 1374-1383.
- Schmidt, R., Lee, T., Winstein, C., Wulf, G., and Zelaznik, H. "Motor Control and Learning: A Behavioral Emphasis." *Human Kinetics*, 2018.
- Schmidt, R., and Wrisberg, C. "Motor Learning and Performance: A Situation-based Learning Approach." *Human kinetics*, 2008.
- Schonbrun, Z. "The Performance Cortex: How Neuroscience Is Redefining Athletic Genius." New York, NY: Dutton, 2019. ISBN: 9781101986332
- Shmerling, Robert H. "Right Brain/Left Brain,

- Right?" Harvard Health, March 24, 2022. <https://www.health.harvard.edu/blog/right-brainleft-brain-right-2017082512222>.
- Steig, P., "How Gabby Giffords Used Music to Regain Her Speech." <https://www.psychologytoday.com/us/blog/is-your-brain/202101/how-gabby-giffords-used-music-regain-her-speech>.
- Stewart, L. "Do Musicians Have Different Brains?" *Clinical Medicine* 8, no. 3 (2008): 304–8. <https://doi.org/10.7861/clinmedicine.8-3-304>.
- Stockinger, C., Focke, A., and Stein, T. "Catch Trials in Force Field Learning Influence Adaptation and Consolidation of Human Motor Memory." *Frontiers in Human Neuroscience* 8 (2014). <https://doi.org/10.3389/fnhum.2014.00231>.
- Sussman, G. J., "A Computational Model of Skill Acquisition." MIT, 1973. ISBN: 978-0444001634
- Swinnen, S., and Wenderoth, N. "Two Hands, One Brain: Cognitive Neuroscience of Bimanual Skill." *Trends in Cognitive Sciences* 8, no. 1 (2004): 18–25. <https://doi.org/10.1016/j.tics.2003.10.017>.
- Taylor and Francis Group. "Laterality: Asymmetries of Body, Brain and Cognition." ISSN: 1357650x
- Thaut, M. "Rhythm, Music, and the Brain: Scientific Foundations and Clinical Applications." New York: Routledge, 2008. ISBN: 978-0415964753
- Tierney, A., et al. "Individual Differences in Rhythm Skills: Links with Neural Consistency and Linguistic Ability." *Journal of Cognitive Neuroscience* 29, no. 5 (2017): 855–68. https://doi.org/10.1162/jocn_a_01092.
- Trost, W.J., Labbé, C., and Grandjean, D. "Corrigendum to 'Rhythmic Entrainment as a Musical Affect Induction Mechanism'[*Neuropsychologia* 96 (2017) 96–110]." *Neuropsychologia* 136 (2020): 107235. <https://doi.org/10.1016/j.neuropsychologia.2019.107235>.
- Viskontas, I. "Brain Myths Exploded: Lessons From Neuroscience." *The Great Courses*, 2017. ISBN: 978-1629973715
- Vuoksima, E., Koskenvuo, M., Rose, R. J., & Kaprio, J. "Origins of Handedness: A Nationwide Study of 30,161 Adults." *Neuropsychologia*, 47(5), 1294–1301. 2009. <https://doi.org/10.1016/j.neuropsychologia.2009.01.007>
- Wesley, A., "An Analysis for Snare Drumming Technique Via Motion Capture." April 2022 <https://doi.10.13140/RG.2.2.24690.79045>
- Williams, S. "Non-Righthandedness." *Academia Letters*, 2022. Article 4777. <https://doi.org/10.20935/AL4777>
- Yates, C., Justus, T., Atalay, N., Mert, N., Trehub, S., "Effects of Musical Training and Culture on Meter Perception." *Psychology of Music* 45, no. 2 (2016): 231–45. <https://doi.org/10.1177/0305735616657407>.
- Zagorski-Thomas, Simon. "Real and Unreal Performances: The Interaction of Recording Technology and Rock Drum Kit Performance" *Musical Rhythm in the Age of Digital Reproduction*, 2016, 195–212. <https://doi.org/10.4324/9781315596983-12>. ●