NAVIGATING THE NOISE

Jarred Boyd PT, DPT, MSAT, SCS, CSCS

PURPOSE

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Occam's razor, or the law of parsimony, states that "entities should not be multiplied without necessity". In other words, when attempting to solve a problem, the simplest answer often suffices. However, with the dissemination of (mis)information permeating society it can be challenging to determine the simplest truths. Consequently, on one end of the spectrum ***complexity*** may emerge as we attempt to orchestrate the abundance of facts we are exposed to without any anchoring principles. On the opposite end of the spectrum overt ***reductionism*** may emerge as we attempt to condense integrated manifestations into isolated incidents. Each of these, both being extremes, have possibility to either leave us drowning in a sea of ambiguity, or provide a false sense of security that we "know" truth and fully understand the concept at hand.

Facts without anchoring principles, or a collective consensus of a topic, increase our propensity to create more assumptions. These assumptions may alleviate our feelings of vulnerability in the face of uncertainty by filling in our gaps of knowledge and information to make sense of the world around us (or clinical presentation in our case). As a result, the ***Dunning-Kruger effect***, a cognitive bias by which people overestimate their abilities (or underestimate their incompetence) is magnified. This invites a sense of superiority and false confidence, reducing our self-appraisal process and the quest for information that holds the strongest credence.

Clinically, lacking principles and "domain specific" foundational knowledge may manifest as ***confirmation bias***, which is the tendency to consciously and especially subconsciously, seek out or interpret information that verifies our pre-existing beliefs. Although this bias is inherently part of being a human, failure to be cognizant of it can lead to inappropriate, inaccurate, or unnecessary interventions.

Being anchored by principles may dissuade us from selecting interventions and methods based solely off of personal preference, emotion ***(affect heuristic)*** or intuition. Instead, it may encourage us to be more pragmatic as we have guardrails in place to increase our conscious ability to select a (potentially) more efficacious intervention.

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PURPOSE CONT.

This is not to state that intuition is something we should simply disregard, but rather it may provide more veracity if we develop a mental repository of credible literature to serve as a premise for said intuition. Resultingly, we may refine our ***heuristics***, or mental shortcuts/ "rule of thumb", that while undeniably also lead to bias, can mitigate the ***(paralysis by analysis)*** phenomena. It is neither efficient nor cognitively resourceful to examine every piece of information we have ascertained when seeking a solution to a clinical problem. Thus, we once again see why principles are integral features of the ideological system we subscribe to.

The beliefs and values ***(ideology)*** we attribute to our respective systems, be it rehabilitation or training, will (in)directly influence our behaviors. These beliefs and values are, to an extent, predicated off of prior experiences/ exposures and people we highly favor. This may be problematic as our memories are fallible, failing to provide consistent accuracy which perpetuates the ***availability bias,*** which is the propensity to believe that information we readily retrieve is more representative than it truly is. Furthermore, holding onto beliefs that are bestowed upon us by people we favor may lead to ***appeal to (false) authority,*** which is asserting that a fact is valid because an "expert" says so.

These two impediments to our memory may jeopardize our critical thinking skills needed to make, presumably, more valid and reliable judgments. However, they can be moderated by intentionally and consistently updating our beliefs of specific conclusions as credible evidence emerges ***(Bayes' Rule).*** The intention behind the pursuit of knowledge is not to establish certainty, as this is a non-existent feature of scientific research, but instead increase our confidence of providing informed decisions that is well supported void of pseudoscientific claims and low credence.

It would be impractical to provide a resource that covers all rehabilitation, movement, performance etc. topics. Additionally, it would be unrealistic to offer every article, blog, podcast and book pertaining to said topic. Even if the aforementioned were provided it would not be as favorable as one may be led to believe. This is because one of the components of learning (true retention as opposed to simply acquisition) is ***personal investment***. Therefore, the onus is on you, the reader, to use this document as a starting point into the pursuit of further information and in turn using it to establish relevant principles. And thus, I present to you Navigating the Noise, an amalgamation of topics and resources to progress both reasoning and rationale.

*This only the initial start of this document as it will continuously be developed with additional sections and relevant articles.

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WHY ACL

Excerpt by: **Dr. Nicole Surdyka PT, DPT, CSCS**

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Courses: Managing the [Un] Injured Soccer Player & Ethical Return To Sport Decision Making

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The Although it may not be the most common of all injuries, an anterior cruciate ligament (ACL) tear leads to a recommended 9-12 months missed from sport which accounts for quite a significant burden of injury. Even more significant is that about 1 in 4 young athletes who return to cutting and pivoting sports will suffer a second ACL injury, placing them at about a 6-fold increased risk of suffering a second ACL injury as an athlete who has never had one at all. In most cases, this second injury will occur within 1-2 years of returning to sport.

Why are athletes at such an increased risk of reinjury upon returning to sport after an ACL injury? Aren't we testing them to make sure they are prepared to return to sport? Return to sport (RTS) testing is meant to serve 2 purposes: 1) to objectively assess an athlete's readiness to return to sport and 2) to ascertain whether or not they are at risk of a reinjury. Unfortunately, there is no universally accepted standard of what a RTS testing battery should look like. Furthermore, the commonly utilized RTS testing batteries are not very predictive of secondary injury, and a very small percentage of athletes actually pass them prior to returning to level 1 sports such as basketball, soccer, and football.

Our RTS testing criteria must improve. Even more importantly, however, the entire rehabilitation process leading up to RTS testing needs to improve. In my view, there are three main ways that this can happen: 1) better application of strength and conditioning principles, 2) incorporation of neuroscience and motor learning, and 3) an on field or on court rehabilitation program.

The application of fundamental strength and conditioning principles is a critical component of any successful rehabilitation program. We must be able to understand and appreciate the sport, position, and specific individualized demands of the athlete and then reverse engineer the athlete's rehabilitation program until we meet them at their current level of ability and capacity. Doing this ensures that we will load athletes appropriately, prepare them for the demands they will face once they return to their sport, and can help us set realistic and meaningful long and short term goals.

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WHY ACL CONT.

An ACL tear is not only a knee injury, but also a disruption to the nervous system. Some of the neuroplastic changes we see in association with ACL injuries are errors of estimation, increased reliance on visual feedback, and decreased motor cortex excitability. There are some common compensations that we tend to see in athletes after an ACL reconstruction (ACLR) such as decreased knee flexion during deceleration and change of direction tasks. These negative movement compensations and neuroplastic changes may even be further perpetuated by our current rehabilitation practices.

One of our main roles as rehab professionals is that of a teacher. The athlete needs to learn how to perform certain tasks again without the compensations often seen after an ACLR that may put them at increased risk of reinjury. When an athlete goes back to their sport, they need to be able to interact with the environment, multi-task, and perform the sport with automaticity. It's no good to the athlete if they're able to perform a perfect squat in front of a mirror in the clinic if they cannot efficiently land from a jump on the field or court. Rather than being satisfied with short term technique success, we should be seeking true long-term motor learning. In order to effectively achieve this, we need to be cognizant of ways that we can utilize our cues, feedback, and the environment in order to drive implicit learning.

Finally, I am a big proponent of implementing an on field (or on court) rehabilitation program for athletes. In addition to a sound strength and conditioning program, an on field rehabilitation program can help an athlete bridge the gap between rehabilitation and performance. An on field rehabilitation program helps to add chaos, puts athletes back in the environment in which they'll be performing, and can help their psychological readiness to return to sport. A good program that progresses an athlete through linear movements, multi-directional movements, sport-specific skills, and modified sport training sessions can help restore movement quality, improve physical conditioning, restore sport-specific skills, and progressively develop chronic training load.

After an ACLR surgery and a lengthy rehabilitation process, the last thing any athlete wants is to have to go through it again. Unfortunately, the reality is that many athletes will sustain subsequent injury once they return to sport. There is much room for improvement in ACLR rehabilitation, but there are some key things we can do to improve long-term outcomes and reduce the risk of secondary ACL injury. Applying principles of strength and conditioning, addressing the neurological impairments and utilizing principles of motor learning, and implementing an on field or on court rehabilitation program may help bridge the gap between rehabilitation and performance to better prepare athletes for their sport demands.

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ACL *(15 Influential Articles)*

Articles

- Anderson, Michael J et al. "A Systematic Summary of Systematic Reviews on the Topic of the Anterior Cruciate Ligament." *Orthopaedic journal of sports medicine* 2016.
- Evans, S., Shaginaw, J., & Bartolozzi, A. Acl reconstruction - it's all about timing. *International journal of sports physical therapy* 2014.
- Andrade R, Pereira R, van Cingel R, et al. How should clinicians rehabilitate patients after ACL reconstruction? A systematic review of clinical practice guidelines (CPGs) with a focus on quality appraisal (AGREE II) British Journal of Sports Medicine 201
- Filbay, Stephanie R, and Hege Grindem. "Evidence-Based Recommendations for the Management of Anterior Cruciate Ligament (ACL) Rupture." *Best Practice & Research. Clinical Rheumatology*, 2019.

Articles Cont.

- Grindem, Hege, et al. "Simple Decision Rules Can Reduce Reinjury Risk by 84% after ACL Reconstruction: the Delaware-Oslo ACL Cohort Study." *British Journal of Sports Medicine* 2016.
- Davies, William T, et al. "Is It Time We Better Understood the Tests We Are Using for Return to Sport Decision Making Following ACL Reconstruction? A Critical Review of the Hop Tests." *Sports Medicine (Auckland, N.Z.)*, 2020.
- Schmitt, Laura C, et al. "The Impact of Quadriceps Femoris Strength Asymmetry on Functional Performance at Return to Sport Following Anterior Cruciate Ligament Reconstruction." *The Journal of Orthopaedic and Sports Physical Therapy*, 2012.

Blogs/Websites

- https://www.mickhughes.physio/
- https://www.wesleywangdpt.com/blog/
- https://www.physio-network.com/category/acl/
- https://thesciencept.com/why-a-quad-index-matters/
- https://www.nicolesurdykaphysio.com/blog/
- https://medium.com/@mattjordan_82317

Podcasts

- Physioedge Episodes: 34, 52, 79,
- BJSM Episode: 325
- The Physical Performance Podcast Episode: 149
- The Art of Coaching Episode: 46
- Pacey Performance Podcast Episode: 156
- The Wesley Wang DPT Podcast
- The Physical Preparation Podcast Episode: Dr. Matt Jordan
- R2P Academy Episode: July 27th 2020
- Complete Football Health Podcast Episode: 17 Season 2
- Barbell Medicine Episode: 114

Names To Know

- Claire Ardern
- Amy Arundale
- Zach Baker
- Matt Buckthorpe
- William Davies
- Dustin Grooms
- Tim Hewitt
- Mick Hughes
- Matt Jordan
- Erik Meira
- Michael Reiman
- Nicole Surdyka
- Wesley Wang

*Not intended to be an exhaustive list

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ACL CONT...

Articles	Articles Cont.	Blogs/Websites	Podcasts	Names To Know
▪ Montalvo AM, et al. "What's my risk of sustaining an ACL injury while playing sports?" A systematic review with meta-analysis. Br J Sports Med. 2019. ▪ Montalvo AM, et al. Anterior Cruciate Ligament Injury Risk in Sport: A Systematic Review and Meta-Analysis of Injury Incidence by Sex and Sport Classification. J Athl Train. 2019 ▪ Webster KE, Hewett TE. Meta-analysis of meta-analyses of anterior cruciate ligament injury reduction training programs. J Orthop Res. 2018. ▪ Hewett TE, et al. Mechanisms, prediction, and prevention of ACL injuries: Cut risk with three sharpened and validated tools. J Orthop Res. 2016	▪ Davies, G. et al. ACL Return to Sport Guidelines and Criteria. *Current reviews in musculoskeletal medicine* . 2017 ▪ Gokeler A et al. Principles of Motor Learning to Support Neuroplasticity After ACL Injury: Implications for Optimizing Performance and Reducing Risk of Second ACL Injury. Sports Med. 2019. ▪ Ardern CL, et al. Return to sport following anterior cruciate ligament reconstruction surgery: a systematic review and meta-analysis of the state of play. Br J Sports Med. 2011. ▪ Grooms DR, Page SJ, Nichols-Larsen DS, Chaudhari AM, White SE, Onate JA. Neuroplasticity Associated With Anterior Cruciate Ligament Reconstruction. J Orthop Sports Phys Ther. 2017			