SHOW NOTES

The Environment is the Lesson Plan

The Environment is the Lesson Plan

Episode 2 | Season 3 | *Coaching Research To Results Podcast*

EPISODE AT A GLANCE

Paper	Acquiring skill in sport: A constraints-led perspective
Author	Davids, K., Araújo, D., Shuttleworth, R., & Button, C.
Published	International Journal of Computer Science in Sport, 2(2), 31-39, 2003
Episode Length	Under 15 minutes
Tags	constraints-led approach, skill acquisition, task simplification, instructional feedback, discovery learning, practice design, equipment

THE THREE STICKY IDEAS

These are the labels to remember from this episode. They are designed to stick with you long after the research fades.

The Environment is the Lesson Plan

Skill does not develop through a coach's instruction and an athlete's copying; it emerges from the interaction of three constraints: the individual athlete, the task, and the environment. The practice environment is therefore an active participant in learning, not just a backdrop, so every change to field size, ball, rules, or time pressure changes what is actually being learned.

Right Tool for Right Size

In a study using a smaller, denser ball (the FDS) with beginner youth soccer players, the FDS group later outperformed a group trained with a standard ball on a juggling test using that standard ball. The smaller ball produced better sensory feedback for a developing nervous system, showing that adult-sized equipment handed to children is not a neutral choice, since it actively shapes what and how quickly they learn.

Keep the Wiring Intact

Breaking a skill into separate parts, such as practising a ball toss without the strike, can disconnect the neural pathways that link perception and action, since research shows two distinct visual pathways handle object recognition and action separately. Rather than decomposing a skill into isolated parts, the paper recommends task simplification: keep the whole skill together and simply reduce its scale, speed, or size.

SHOW NOTES

TWO ACTIONS FOR TOMORROW

Take one or more of these actions into your next coaching session.

Audit Your Drills Through the Three Constraints

Take a drill you run regularly and examine it through the lens of individual, task, and environmental constraints: are they suited to your actual athletes, and do they reflect the pressures of competition? Doing this reveals what your practice environment is really teaching, which may not match what you intended.

Use Task Simplification, Not Decomposition

When introducing a complex skill, keep it whole and simplify its scale, speed, or space rather than breaking it into isolated parts to practise separately. This preserves the connection between perception and movement that skilled performance depends on.

RESEARCH REFERENCE

Primary Source: Davids, K., Araújo, D., Shuttleworth, R., & Button, C. (2003). Acquiring skill in sport: A constraints-led perspective. International Journal of Computer Science in Sport, 2(2), 31-39.

Counterpoint Sources: Magill, R. A. (2001). Motor Learning: Concepts and Applications (6th ed.).

LINKS AND RESOURCES

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Share this episode with one coach this week, since that's how research actually travels.

FULL EPISODE TRANSCRIPT

The following is the complete script for this episode of *Coaching Research To Results*.

Cold Open

You know the drill. Literally. The drill.

Practise the ball toss. Practise the run-up. Practise the footwork. Then, and only then, put it all together. It is Coaching 101, and most of us learned it from someone who learned it from someone else. Break the complex skill down, build it back up, check.

Well, here's the problem. Research into how athletes actually acquire skills says that breaking a skill apart does not just simplify learning. It can actively damage it. Because what you strip away when you separate the components is not the complexity: it's the connection. And the connection of the skill is the whole point.

This week's paper is going to make you think very differently about what your practice environment is teaching your athletes. And the good news? The solution is simpler than you think.

Intro and Show ID

The Paper

The paper is called, "Acquiring Skill in Sport: A Constraints-Led Perspective". It was published in the International Journal of Computer Science in Sport in 2003. The lead author is Keith Davids, who was at the School of Physical Education at the University of Otago in New Zealand at the time, and who has become one of the most cited researchers in what is now called ecological dynamics and constraints-led coaching. His co-authors are Duarte Araújo, Richard Shuttleworth and Chris Button, who were all also from Otago at the time.

The paper is a theoretical review, which means it synthesises a whole bunch of related papers to build a practical argument. What prompted it was a growing body of work applying complexity science and nonlinear dynamics to sport. Davids and colleagues wanted to translate those ideas into something coaches could actually use. They set out to do three things: explain the theoretical framework, review key constraints on skill development, and draw practical implications for how coaches should structure feedback and practice. What they produced is essentially a blueprint for a different kind of coaching.

Big Idea #1

The big idea from the paper could be called The Environment is the Lesson Plan.

Here is the core of it. Skill does not develop because a coach prescribes a technique and an athlete copies it. Skill emerges from the interaction of three different categories of constraints. Individual constraints are things within the athlete: their height, their strength, their current skill level, their age, their fatigue. Task constraints come from the activity itself: the rules, the goal, the size of the ball, the number of opponents, the time available. Environmental constraints come from the surrounding context: the surface, the weather, the noise, the crowd, the temperature.

These three do not work in isolation. They interact constantly, and the movement pattern that emerges from that interaction is the learner's best available solution to all of them at once. The coordination pattern is not stored in the brain and retrieved. Instead, that ideal movement pattern assembles itself under constraint, every time.

What does this mean for you? It means the practice environment you design is not just a backdrop for learning. The environment itself is an active and highly influential participant in learning. Every time you change the field size, the number of players, the ball, the rules, or the time pressure; any number of constraints, you have just changed what is being learned. The question is: are you changing with intent?

Your athletes are not simply learning from your instructions. They are learning from the environment you put them in. The instructions are optional. The environment is not.

Ideas #2 and #3

The idea here is summarised as “Right Tool for Right Size.” The paper highlights research on a ball called the Futebol de Salão, or FDS, a smaller, denser ball used in futsal and widely used in Brazilian football development. In this research, an 11-year-old group of beginner soccer players was split in two. One group trained with the FDS ball. The other trained with a standard size 5 ball. After the training period, both groups were tested on juggling with the conventional size 5 ball. The FDS group outperformed the control group significantly.

Why? Because the smaller, heavier ball directed the learners toward the kind of sensory information, the feel through the foot, the haptic and proprioceptive feedback, that is relevant for building solid coordination patterns. The standard adult ball was too big and too light to generate that quality of information for a developing nervous system.

The broader implication is pointed: children are not mini-adults. And equipment designed for adults, handed to children without modification, is not neutral. It actively changes what can be learned and how quickly. The constraint ends up being wrong, so the learning environment is suboptimal.

Think about your sport. Are there pieces of equipment you hand to young or developing athletes because that’s what is available? Are you accidentally setting a task constraint that works against skill development rather than for it? Remember, the constraint isn’t just the background… It is actively doing the teaching.

Now we’ll look into practice structure, and to what I think is the most practically disruptive idea in this paper. Idea number three is to “Keep the Wiring Intact.”

Coaches commonly break complex skills apart. The volleyball player practises the ball toss separately before practising the serve. The long jumper practises the run-up without the jump. The logic is: reduce the attentional load, master the components, then combine them. This approach has a name in the research literature: it’s called, “task decomposition.”

The paper argues this is a mistake in most cases, and the neuroscience backs it up. The brain has two visual pathways. One identifies objects. The other guides actions directed at those objects. When you practise the volleyball ball toss without the strike, you are training one pathway without the other. You are literally cutting the wire between perception and action. The skill you want your athletes to learn depends on that wire being intact and strengthened.

The alternative the paper proposes is task simplification: keep the whole skill together but reduce its scale or intensity. Shorter run-up. Lower ball toss. Slower speed. Smaller space. The

movement stays whole. The connection between seeing and doing stays connected. You are reducing the amplitude, not amputating the connection.

Ask yourself: are there skills in your programme where you decompose because it feels more manageable? Where you could instead simplify the whole, rather than isolate the parts? That shift in approach is the difference between building the bridge and taking it apart to study the cables.

The Counterpoint

Now, let's complicate the picture a little, because that's how we review good research.

The constraints-led approach makes a compelling case, but it is not universally settled. Richard Magill, whose motor learning textbook is cited in this very paper, has argued that part-task practice retains its value in specific circumstances: particularly when the sub-tasks are low in coupling, meaning they can legitimately be performed independently without degrading learning of the whole. In serial skills, like a swimming stroke, where timing between sub-components is less critical in the early stages, task decomposition may still have a place. In this case, something like separating the upper body movement from the lower body movement in a swimming stroke may work out okay.

There is also a practical reality the paper acknowledges only briefly: discovery learning takes time. In high-performance or time-constrained environments, the freedom to explore the task landscape is a luxury. Coaches working in short pre-season windows, or with large groups, may find that a fully open, constraint-manipulation approach is difficult to implement without very deliberate planning and resourcing.

The counterpoint, in short, is not that the constraints-led approach is wrong. It is that it demands more from the coach in terms of design thinking, not less. You cannot just remove the drill and walk away. You have to thoughtfully design the constraint and sometimes that means that you'll get it wrong.

The Anecdote

This story illustrates "The Environment is the Lesson Plan" idea. A hockey coach I worked with ran what they thought was a great possession drill. Lots of snappy passes, tons of touches, accurate passing, and overall the athletes looked pretty confident moving the puck. It hit all of the meaningful key performance indicators of what they wanted to accomplish come game time.

But, in the next match the same players really struggled to retain possession under pressure. On closer inspection and reflection, the drill the coach had used had fewer opponents, no time pressure, and a generous space ratio. The environment of the drill had taught something real: yet it just wasn't possession under pressure, which was the outcome the coach intended to train so they could compete with a solid opponent.

When the coach redesigned the drill with smaller spaces and a larger number of defenders, the transfer to the game was immediate. The environment mimicked what the athletes would see in a game from this opponent which was overloading an area with defenders to try to force a turnover. In this case, the athletes in possession of the puck just needed to keep possession even with more defenders in a small area. This forced anticipatory and faster movement overall, which then could transfer into the next game.

What the coach learned: [pause] the drill was not teaching what they thought it was teaching, because the constraints did not match the game.

Two Actions

Putting this into action, this week I want you to audit one of your regular drills or practice activities through the lens of the three constraints.

Take a drill you run often and ask three questions. First, what individual constraints does this activity assume? Is it designed for the actual athletes in front of you, at their current size, strength, and skill level, or is it designed for an idealised version of them? Second, what task constraints does this activity include, and what does it leave out? Is the ball the right size and weight? Are the rules preserving the connections between perception and movement, or are they isolating components? Third, what environmental constraints are present, and are they representative of the performance context? Is there time pressure? Opposition? Spatial demand?

You don't need to change anything yet. The first action is simply to see the environment through this lens. Write down what you notice. Then ask: if this environment is doing the teaching, what exactly is it teaching? You may be surprised by your own answer. If you find a mismatch between what you intended and what the environment is actually delivering, you've just found your next design problem to solve.

And, Action Two, the next time you are planning a session to introduce or develop a complex skill, design it using task simplification rather than task decomposition.

Here's the practical test. Write down the skill as a whole action. Then ask: what is the minimum I can reduce, slow, or shrink to make this manageable for my athletes, while keeping the perception-movement connection intact? That might be a shorter run-up, a slower approach, a reduced space, a lighter implement, or a simplified decision. The rule here is: everything that needs to be connected in the game stays connected in practice.

If you find yourself instinctively wanting to break out one component and to practise it separately, stop and ask: what is the information source that connects this component to the rest of the skill? If you can identify it, build the practice around preserving that connection. If you genuinely cannot identify a coupling, that is the one scenario where separation might be warranted. But in most sport skills, the coupling is there. Keep the wire connected.

Close

So here is what we know from this paper.

The environment you design is not just a container for practice. It IS the teacher. Constraints from three directions, from within your athletes, from the task itself, and from the environment surrounding them, interact to shape what movement patterns emerge. Skill is not installed by instruction. It is assembled under constraint.

When you choose an implement, like a ball, that is the wrong size for your athlete, you are choosing a constraint that works against learning. When you break a complex skill into isolated components, you risk cutting the very connection between seeing and doing that skilled performance depends on.

The nugget I want you to carry with you this week is this: your job is not to prescribe the movement. Your job is to design the environment that makes the right movement the most likely solution. Get the constraints right, and your athletes will find the skill themselves.