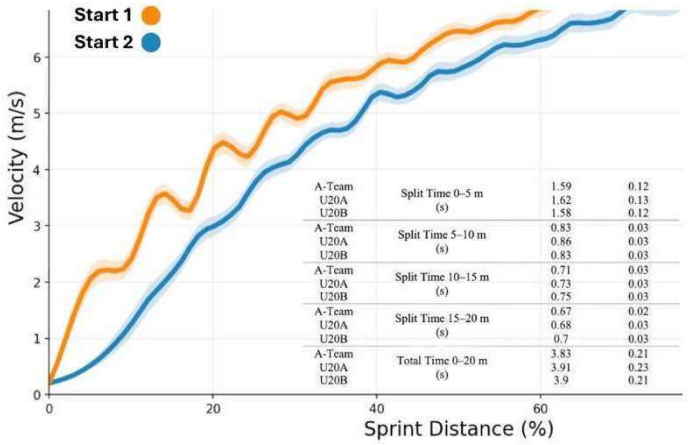
DOES THE START CHANGE HOW WE ACCELERATE?

Different Starting Constraints, Different Acceleration Strategies:
Using Continuous Data to Look Beyond Split Times





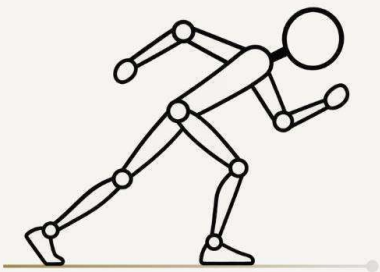
A-Team	Split Time 0–5 m (s)	1.59	0.12
U20A		1.62	0.13
U20B		1.58	0.12
A-Team	Split Time 5–10 m (s)	0.83	0.03
U20A		0.86	0.03
U20B		0.83	0.03
A-Team	Split Time 10–15 m (s)	0.71	0.03
U20A		0.73	0.03
U20B		0.75	0.03
A-Team	Split Time 15–20 m (s)	0.67	0.02
U20A		0.68	0.03
U20B		0.7	0.03
A-Team	Total Time 0–20 m (s)	3.83	0.21
U20A		3.91	0.23
U20B		3.9	0.21

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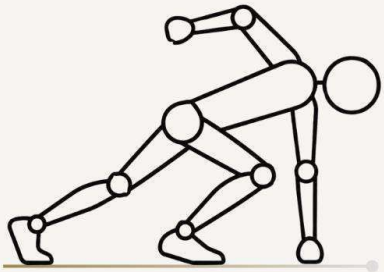
WHY SHOULD THE START MATTER?

EXTENDED
(2–POINT START)



- Higher initial COM requires greater lowering and forward projection
- More extended joints initiate force from relatively shorter muscle lengths
- Longer transition toward effective horizontal force application

FLEXED
(3–POINT START)



- Lower initial COM places the body closer to forward projection
- Greater joint flexion initiates force from relatively longer muscle lengths
- Potential for earlier effective horizontal force application

DIRECTION
(LATERAL START)



- Changes early force orientation with greater lateral–medial muscular demands
- Requires body reorientation before forward acceleration
- May alter early velocity generation and first-step strategy

WHAT DO WE ALREADY KNOW ABOUT CHANGING THE START?

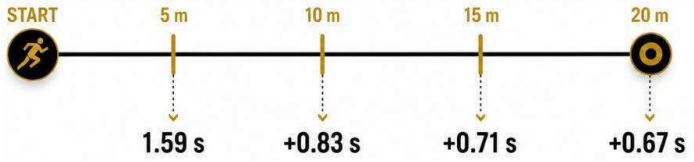
PREVIOUS RESEARCH

SALO & BEZODIS, 2004
Standing vs crouched start
Standing start produced greater horizontal velocity in the initial steps, but the advantage disappeared by ~10 m.

CRONIN ET AL., 2007
Parallel vs split vs false start
Starting stance affected 5- and 10-m performance. The parallel start was ~8% slower at 5 m and ~6% slower at 10 m than the split and false starts.

BEZODIS, WILLWACHER & SALO, 2019
Biomechanics of the track-and-field sprint start
Effective sprint-start performance requires rapid generation of horizontal velocity through appropriate force production and orientation.

SPRINTS ARE OFTEN REDUCED TO SPLIT TIMES

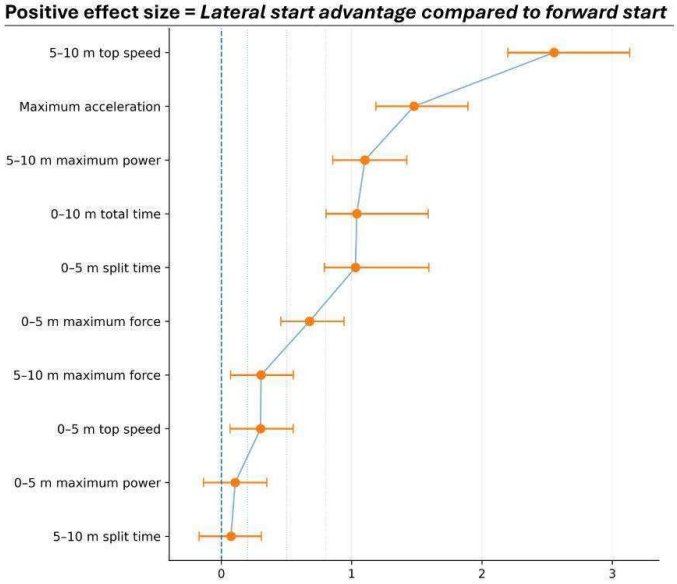


OUR PRELIMINARY DATA

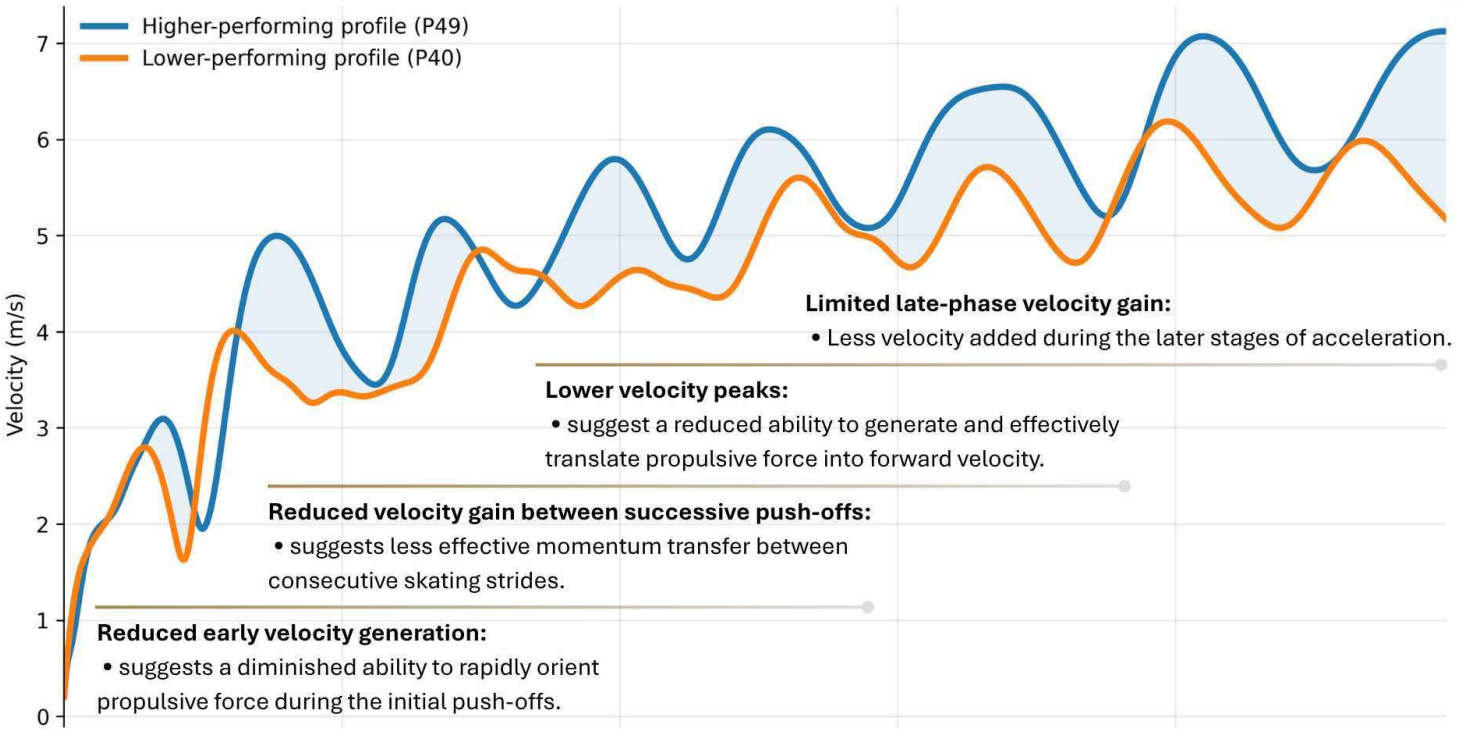
WHAT ABOUT DIRECTION?

Ice hockey athletes | continuous velocity-derived metrics

Positive effect size = *Lateral start advantage compared to forward start*



WHAT DOES CONTINUOUS VELOCITY REVEAL?



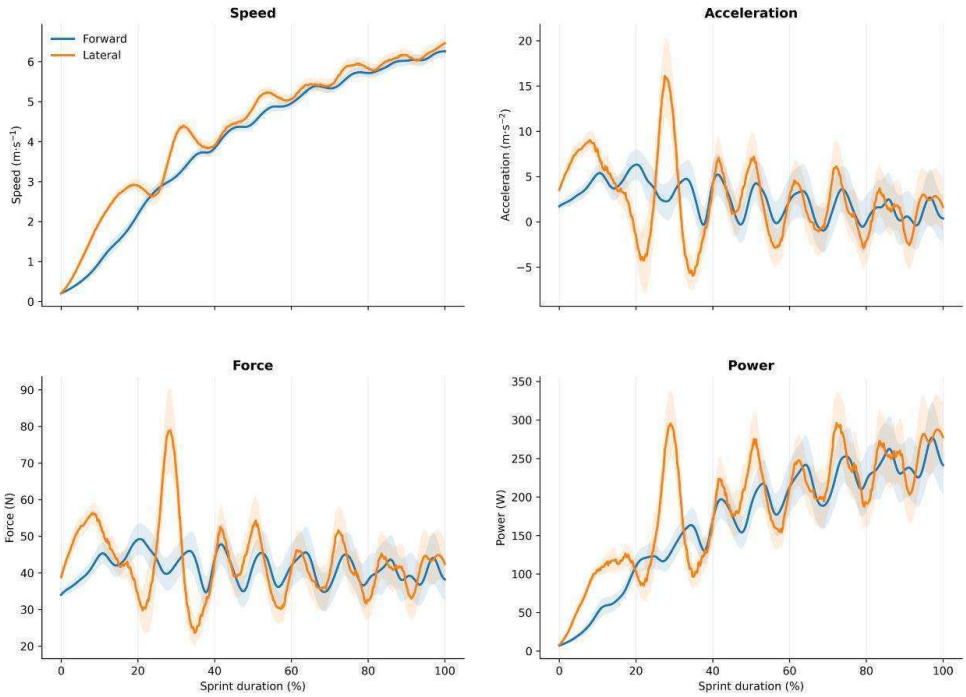
Limited late-phase velocity gain:
• Less velocity added during the later stages of acceleration.

Lower velocity peaks:
• suggest a reduced ability to generate and effectively translate propulsive force into forward velocity.

Reduced velocity gain between successive push-offs:
• suggests less effective momentum transfer between consecutive skating strides.

Reduced early velocity generation:
• suggests a diminished ability to rapidly orient propulsive force during the initial push-offs.

THE CURVE SHOWS WHAT THE SPLITS MISS!



WHAT DO THE TRACES REVEAL?

EARLY VELOCITY

- Different patterns of velocity generation.

PUSH-OFF STRATEGY

- Different acceleration peaks and timing.

FORCE–POWER EXPRESSION

- Different profiles beneath similar speed progression.

CONVERGENCE

- Differences reduce as forward acceleration develops.

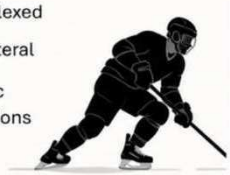
THE OUTCOME MAY CONVERGE.

THE STRATEGY DOESN'T.

SO... WHAT DOES THIS MEAN IN PRACTICE?

1 CHANGE THE START
Manipulate the constraint

- Extended vs flexed
- Forward vs lateral
- Sport-specific starting positions



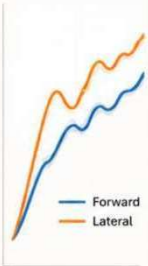
Starting constraints create different acceleration strategies.

2 LOOK BEYOND THE TIME
Measure how velocity develops

Split times = **OUTCOME** (what happened)

Continuous traces = **STRATEGY** (how it happened)

Identify **WHERE** differences emerge during acceleration.



3 TRAIN WHAT THE SPORT REQUIRES
Match the acceleration demand

Different starts expose different **force–velocity demands.**

Use starting constraints **intentionally** in training.

Don't assume one "optimal" acceleration strategy fits every situation.

WHAT WILL WE TRY?

EXTENDED ← **FORWARD** → **FLEXED**
(2-POINT START) ? (3-POINT START)

FLEXED ← **LATERAL** → **EXTENDED**
(SIDE STEP START) ? (KNEELING START)

Change the start (different constraints)

Feel the difference (movement experience)

Measure the trace (continuous data)

Discuss what changed (interpret & apply)

Changing the Start: Sprint Acceleration Practical

The aim of this practical is to explore how starting position and direction influence early acceleration, and how continuous data profiling can reveal differences that conventional split times may not capture.

During the practical, we will:

1. PREPARE ~5 min

Progress from lower- to higher-intensity movement preparation specific to the starts we will use.
Extended and flexed acceleration positions
Forward and lateral orientations
Progressive projection and acceleration drills
Build toward short, high-intensity starts
It will be emphasized that these drills can also be used as acceleration preparation within training.

2. EXPERIENCE ~3 min

Try different starting constraints and feel how they change the first steps.
Forward = Extended 2-point start ↔ Flexed 3-point start
Lateral = Flexed side-step start ↔ Extended kneeling start
Consider what changes in body position, projection, force orientation and early velocity generation.

3. MEASURE ~4 min

Performing selected starts using continuous velocity measurement.
Rather than only asking “Who was faster?”, look at:
How quickly was velocity generated?
Where did the starts differ?
Did the difference persist as acceleration developed?
Could similar split times hide different acceleration strategies?

4. DISCUSS & APPLY ~3 min

Connect what we measured to coaching practice.

QUESTIONS FOR AUDIENCE TO THINK ABOUT:

- Which start felt different and why?
- What changed in body position, projection or the first steps?
- Where did the difference appear in the velocity trace?
- Only immediately after initiation, or further into acceleration?
- Would split times tell us the same story?
- Could two athletes reach the same split differently?
- Which starts actually reflect your sport?
- Consider the positions and directions athletes accelerate from in competition.
- What does this change in training?
- Could starting position, direction or other constraints be manipulated to expose different acceleration demands?