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Description

NHL skaters can reach speeds in excess of 20 miles (32km) per hour, and during some short bursts approach 30 miles (48 km) per hour. Kinematics, the branch of classical mechanics, helps describe a player's movement across the ice by defining his position, velocity and acceleration. "Science of NHL Hockey" is a 10-part video series produced in partnership with the National Science Foundation and the National Hockey League.

Keywords

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CHICAGO MANUAL OF STYLE

Transcript
Science of NHL Hockey – Kinematics
LESTER HOLT, reporting:
From quick starts to sudden stops, hockey is one of the fastest sports in the world. With players in the National Hockey League approaching speeds of 30 miles per hour, there's no question that the quickest skaters have an edge on the ice.

MATT MOULSON (Left Wing, New York Islanders): Hockey has turned into a game where it's a lot of stopping and starting and quick transition, whether that's turning or stopping and getting going quickly.

HOLT: In order to move across the ice, every NHL skater must adhere to the principles of Kinematics, the branch of classical mechanics that defines a moving object in three ways: position, velocity and acceleration. Position is the location of the player on the ice at a given moment.

Dr. ROBERT GEHRZ (University of Minnesota): In hockey position is everything. It is how you position yourself to be in the best possible location to deal with the play at hand.

HOLT: On this play, we can define the starting position of New York Islander left winger Matt Moulson as 25-feet east of center ice.

He skates to a stopping position 75-feet east from center ice, changing his position by 50-feet to the east. Here, Moulson receives the puck and fires it into the back of the net.

Dr. EDWARD BURGER (Williams College): You want to be able to place players strategically almost like a chess game. You want to have your players in place so that as the game progresses your team will be sufficiently placed to be the most effective.

HOLT: But unlike chess, these game pieces are constantly on the move, which is where the second kinematic concept comes into play. Velocity describes two things about a moving player: his speed and

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his direction.
BURGER: What velocity tells us about a particular player, for example, is where he will be at a particular future point, assuming that in fact he's, let's say, skating straight ahead. Then I can predict if I just know his velocity where he'd be one second later, two seconds later and four seconds later.
HOLT: To help illustrate the concept of velocity, we filmed Moulson with a Phantom cam, a special high-speed camera that records movement at up to 10,000 frames per second. Starting at the goal line, Moulson sprints to the blue line 64-feet away. If he completes this distance, in 2.3 seconds, it's easy to calculate his average speed by dividing the distance by the time.
HOLT: To define Moulson's average velocity, we just add the direction he's moving in: 27.83 feet per second, west.
On the ice, fast skaters have a key advantage.
MOULSON: Speed is important when you are doing different things in the game, a breakaway. If you already have a step on the defender and you have great speed, you are going to pull away from that defender.
HOLT: But during a breakaway, a skater doesn't move at a constant speed. With each stride of his skates, he's picking up speed, moving faster and faster. This is where the third kinematic concept comes into play: acceleration.
MOULSON: Acceleration is probably the more important thing in hockey right now.
HOLT: Acceleration is the change in a player's speed and/or direction over a period of time. Think of a space shuttle blasting off. It's slow at liftoff, but steadily builds speed. In hockey, a player's acceleration changes almost every second of the game, when speeding up, slowing down, or weaving between defenders.
GEHRZ: Acceleration is what produces a change in velocity. Acceleration can produce a change either in the magnitude of velocity, that's the speed, or the direction or both.
HOLT: To understand acceleration, let's go back to Moulson's sprint. Let's say, hypothetically, that his top speed is 23-feet per second. If it takes him 1.4 seconds to reach this speed, we can calculate his average acceleration by dividing his velocity by the time: 16.43 feet per second, per second - or feet per second squared. On average, Moulson gets 16.43 feet per second faster every second. If he could keep up that acceleration, at the end of two seconds he'd be going 32.86 feet per second.
GEHRZ: If you are on a breakaway, you want to be able to accelerate rapidly to move away from your opponents.
HOLT: Players who accelerate rapidly can often beat a faster player to the puck because they're able to reach their top speed more quickly.
MOULSON: Guys are jumping into holes, getting opened, and you know, like, that's-- a lot of that is acceleration just couple quick steps getting open, getting away from defenders.
HOLT: Position, velocity, and acceleration: three key aspects of kinematics that define how players like Matt Moulson are so successful on the ice.