

The Look-Up Line Study Summary of Findings for USA Hockey

In order to reduce injuries in ice hockey, a “look-up-line” (LUL) has been proposed, which is a 1 m (40 in) wide orange line painted on the ice at the base of the boards. We determined if elite offensive (O) and defensive (D) players looked up more on a rink outfitted with the look-up-line (LUL rink) compared to a traditional rink (Control rink). Two mobile eye trackers, two electrogoniometers and two external cameras were used to determine head orientation, fixations on critical cues, and quiet eye (QE) during a 1 on 1 checking play on each rink. Synchronized O and D data were analyzed on both rinks during four phases: 1) read the opponent, 2) make a decision, 3) cut to the boards, and 4) contact between O and D, ending in an attempt to score on a net outfitted with a shooter tutor. Trial duration averaged 7.5 seconds. Average duration of the phases were as follows: phase 1, 3.1 seconds; phase 2, 1.0 seconds; phase 3, 2.1 seconds; and phase 4, .72 seconds.

- 1) During phase 1, the electrogoniometer data showed that both O and D looked up more on the LUL rink than when the same players competed against one another on the Control rink.
- 2) Analysis of the eye tracking data during phase 1, indicated the O players fixated critical cues earlier on the LUL rink, indicating greater anticipation than when they performed on the Control rink.
- 3) No differences were detected during phase 2.
- 4) During phases 3 and 4, the electrogoniometer results indicated both O and D looked down more on the LUL and Control rinks as they tried to maintain and/or gain control of the puck. Risk of injury was therefore equivalent on the two rinks.
- 5) During phases 3 and 4, analysis of the eye tracking data showed there were more fixations on the orange warning line on the LUL rink, than on a similar area along the boards on the Control rink for both O and D. More research will be needed to determine if this occurred due to the darker color of the LUL which may have made it harder to control the puck, requiring more fixations than when the same players performed on the white ice of the Control rink. There was no evidence fixations on the orange LUL led to a change upward in head orientation, or an increase in fixations upward on the boards or another location.
- 6) During phase 4, both O and D skated further from the boards on the LUL rink as they crossed the ringette line, compared to when they performed on the Control rink. This may have been caused by the players preferring to control the puck on the white ice, than on the darker orange of the LUL line.
- 7) QE duration was longer on goals scored on the LUL rink than on the Control rink, indicating the O had more time to prepare an accurate shot. This result is consistent with previous studies showing a longer QE duration is a characteristic of superior performance. Number of goals did not differ, but there were more shots on goal on the LUL rink than on the Control rink. In combination, these results suggest the LUL may have opened up the game and led to more scoring opportunities.

Recommendations

- 1) The results lend partial support to the LUL, but do not allow us to support or condemn universal implementation of the LUL.
- 2) The presence of a LUL on the ice surface creates an opportunity for player education on the risk of contact near the boards, as well as injury prevention strategies.
- 3) More research is needed to determine if the LUL improves safety in ice hockey. Future epidemiological research using validated injury surveillance in youth ice hockey evaluating the influence of the LUL and programs such as "Heads Up, Don't Duck" injury and concussion prevention is warranted.
- 4) More research is also needed to determine if the presence of the LUL changes how the game of ice hockey is played. Future studies should consider these questions:
 - a) During games, does the presence of the LUL cause both O and D to skate further from the boards than when they perform on a traditional rink?
 - b) Does the distance skated from the boards increase or decrease the risk of injury in ice hockey?
 - c) Does the LUL open up the game and create more scoring opportunities compared to what occurs on a traditional rink?
 - d) Should the LUL be a lighter color than the orange color now used?
 - e) Would a narrower line painted on the ice 40 inches from the boards achieve the same results, as the solid 40 inch line that is now proposed?
 - f) Would placement of the LUL on the base of the boards, rather than the ice surface improve puck control and prevent injuries?
 - g) Does the orange ice surface (Look Up Line) make it harder for the player to control the puck? Do they use more fixations to maintain the same level of control when compared to white ice.

“Effect of the Look-Up Line on the Gaze, Head Orientation and Performance of Elite Ice Hockey Players”

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