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A Bayesian test for the hot hand phenomenon

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The hot hand phenomenon refers to the popular notion that the performance of sports players is punctuated by streaks of exceptional performance. During these streaks, the player is said to be 'hot', or even 'on fire'. Unfortunately, when it comes to assessing evidence for the hot hand phenomenon, human intuition is inadequate—people are known to perceive streaks even in sequences that are purely random. Here we develop a new statistical test for the presence of the hot hand phenomenon for binary sequences of successes and failures. The test compares a constant performance model to a hidden Markov model with two states (one representing hot performance, and one representing cold performance) and one probability of switching from one state to the other. We assume appropriately restricted uniform priors on the model parameters and compute the Bayes factor by integrating the likelihood over the prior. The test is assessed in a simulation study and applied to real data sets from basketball and from psychology. Our analysis suggests that it is difficult to find compelling evidence for and against streakiness except for very long data sequences and extreme forms of streakiness.