Researchers study effects of weather, distance and running on athletes

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The heat index at soccer matches, such as between Ole Miss and Northwestern in 2016, can adversely affect running performance, according to a recent study by UM professors. Credit: Thomas Graning/Ole Miss Communications

Amid discussions of the possible effects of global warming, University of Mississippi professors have determined that extreme heat can greatly affect players' performance in the world's premiere international soccer competition.

Nick Watanabe and Grace Yan, both assistant professors in the UM Department of Health, Exercise Science and Recreation Management, joined Pamela Wicker of German Sport University Cologne in studying the effect of weather conditions, travel distances and rest days on running performance. Their results are published in the latest issue of the *Journal of Sport Management*.

"Our research finds that heat does decrease performance, and thus could have potential issues with the 2022 World Cup scheduled to be hosted in Qatar, where the weather is rather warm even in the winter months," Yan said. "We think that with the World Cup qualifying about to start up again soon for the 2018 World Cup, the present study has implications for policymakers regarding the choice of future host countries."

The group of researchers used data gathered from Matrics, a high-tech player tracking technology that FIFA, the international governing body for soccer, used to measure distances and speeds run by players during the 2014 FIFA World Cup.

The Matrics technology helped capture extensive data in real time from soccer matches, including heat maps, attacking zone, the number of sprints for individual players and the exact distance each player ran. From this, the researchers were able to observe the performance at both the player-level (1,644 of the total 1,777 player appearances during matches) and the team-level (128 observations over 64 matches).

Using this and other data from the World Cup website, the team found that the heat index – combining temperature and humidity – significantly decreased running performance.

The next two World Cups have been awarded to Russia and Qatar, initiating discussions about temperature and travel distances related to the game, including whether some countries may have environmental conditions that make them unsuitable to host mega-events such as the World Cup.

"The results of our models, which control for factors such as travel distance and rest, find that the decreased running abilities not only affect the distance players run, but also reduces the number of attacking opportunities for teams," Watanabe said.

"When these models are used to predict running performance at the 2022 Qatar World Cup, our projections indicate that the combination of heat and wind could hinder the performance of both players and teams and create potentially dangerous conditions for the players."

Players in other outdoor sports, including football, baseball, track and cross country, also may potentially be affected by heat, travel times and opportunities for rest, the UM researchers agreed.

"While we cannot apply these results directly to other sports, it certainly opens the door to utilizing this type of technology and data to help better understand player and team performance," Wantanabe said. "These findings are in line with previous research documenting that especially high-intensity running deteriorates as temperature increases."

According to FIFA, 3.2 billion people worldwide watched the 2014 Brazil World Cup tournament.

More information: Nicholas Watanabe et al. Weather Conditions, Travel Distance, Rest, and Running Performance: The 2014 FIFA World Cup and Implications for the Future, *Journal of Sport Management* (2017). DOI: 10.1123/jsm.2016-0077

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