

# Detecting carpal tunnel syndrome with a smartphone game

March 29 2021

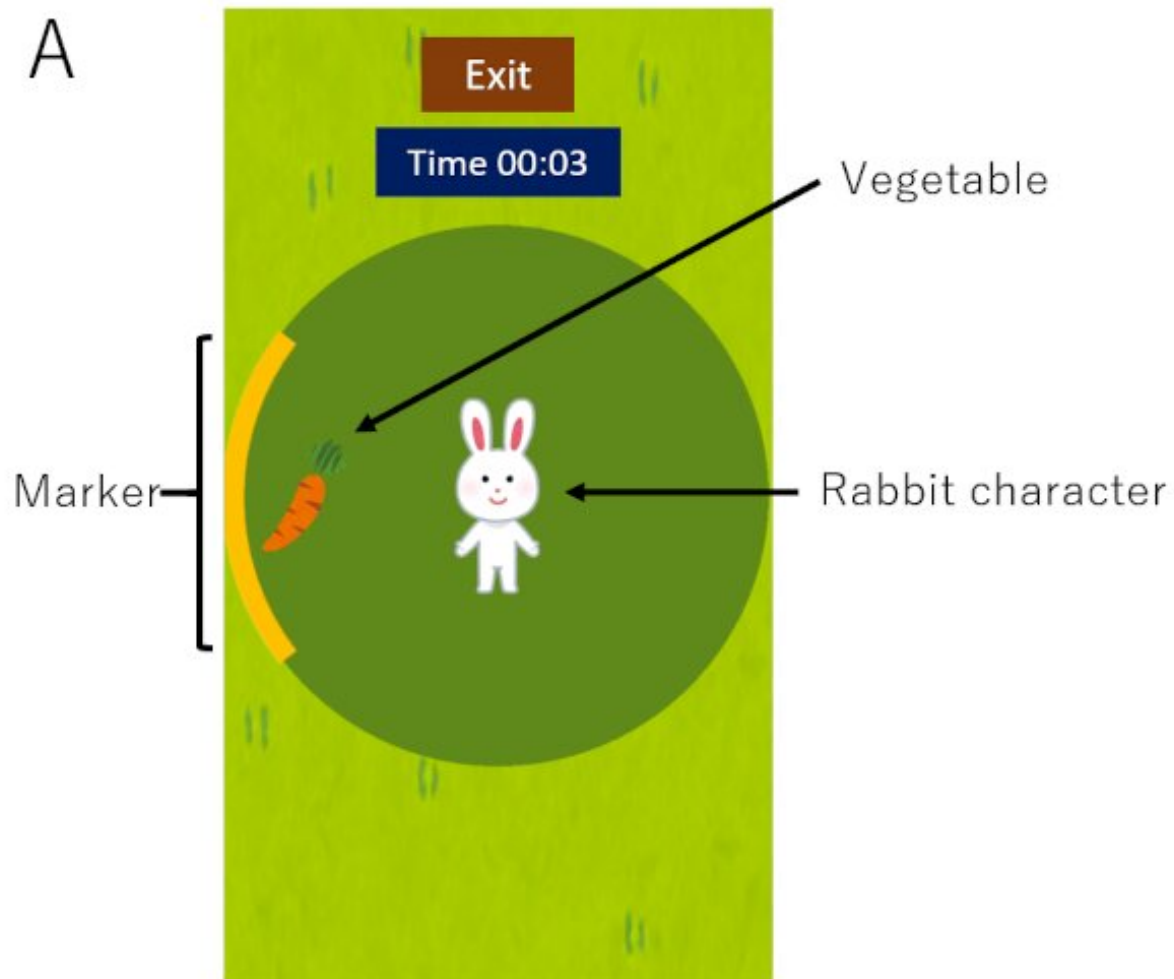


Figure. 1 The image of the app. A rabbit character and vegetables were displayed in the green circle. Vegetables were located at the center or edge of the circle, and markers were also displayed when the vegetables were located at the edge.

Credit: Yuta Sugiura

A Japanese research group combined motion analysis that uses smartphone application and machine learning that uses an anomaly detection method, thereby developing a technique to easily screen for carpal tunnel syndrome. Carpal tunnel syndrome is common amongst middle-aged women. The disease causes compressed nerves in the wrist, causing numbness and difficulty with finger movements. While an accurate diagnosis can be reached with nerve conduction study, this is not widely used because it requires expensive devices and specialized skills. Thus, a simple screen tool that does not require any specialized knowledge or techniques is desired.

The research group of Dr. Koji Fujita of Tokyo Medical and Dental University and associate professor Yuta Sugiura of Keio University focused on increasingly poor movements of the thumb with the advancement of the disease, and analyzed its characteristics. They developed a [game application](#) for smartphones that is played using the thumbs and prepared a program that acquires the trajectory of the thumb during a [game play](#) and estimates the possibility of the disease with [machine learning](#). The application can screen for possible carpal tunnel syndrome using a simple game that can be played in 30 sec—1 minute. Even without gathering [patient data](#), they were able to effectively construct an estimate mode from the data of 12 asymptomatic participants using the anomaly detection method. When this program was applied to 15 new asymptomatic subjects and 36 patients with carpal tunnel syndrome to verify its accuracy, the result was promising with 93% sensitivity, 69% specificity, and 0.86 Area Under the Curve (AUC). This is equivalent or better than the results of physical examinations by expert orthopedic surgeons.

The developed tool can be used to screen for possible [carpal tunnel syndrome](#) at sites where no expert is present, such as at home or at a health center. In the future, the research group aims to develop a system that is able to encourage an examination by an expert when the disease is suspected in order to prevent exacerbation. It would prevent inconvenience and social loss associated with exacerbation of a disease, which is more common among women, and contribute to creating a society where women play an active role.

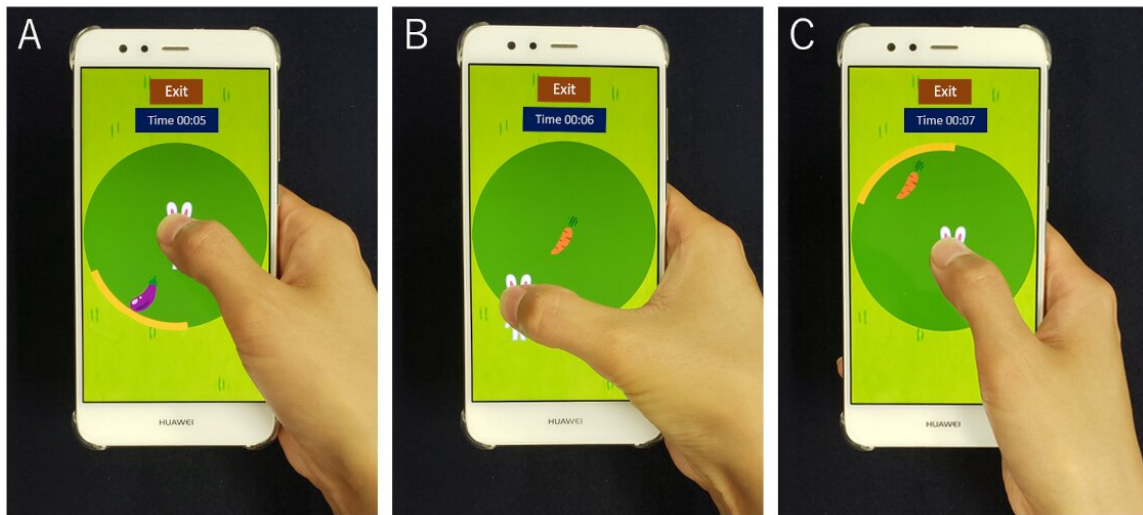


Figure. 2 The images of the app while playing the game. The player touched and controlled a rabbit character with the thumb of each hand to collect vegetables. Vegetables appeared in one of 12 directions (A). When each vegetable was collected, the next appeared alternately at the center of the circle (B) or in another direction (C). Credit: Yuta Sugiura

**More information:** Takafumi Koyama et al. A Screening Method Using Anomaly Detection on a Smartphone for Patients With Carpal

Tunnel Syndrome: Diagnostic Case-Control Study, *JMIR mHealth and uHealth* (2021). [DOI: 10.2196/26320](https://doi.org/10.2196/26320)

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