A Feedback-Controlled Mandibular Positioner Identifies Individuals with Sleep Apnea Who Will Respond to Oral Appliance Therapy

Remmers JE, Topor Z, Grosse J, Vranjes N, Mosca EV, Brant R, Bruehlmann S, Charkhandeh S, Jahromi SA.
J Clin Sleep Med. 2017; 13(7): 871–880.

STUDY OBJECTIVES

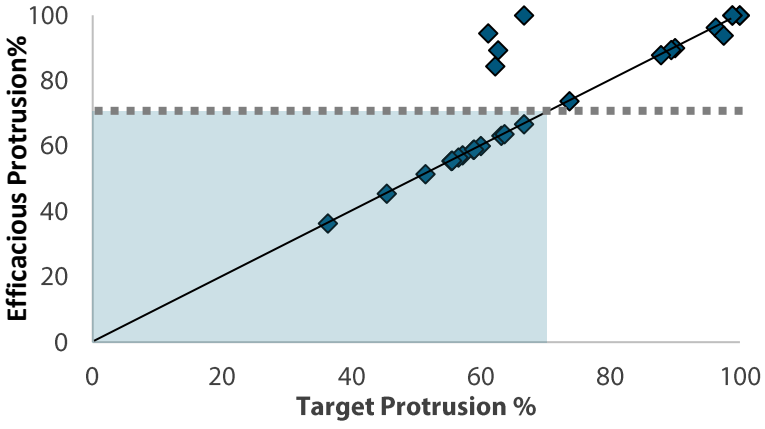
Mandibular protruding oral appliances represent a potentially important therapy for obstructive sleep apnea (OSA). However, their clinical utility is limited by a less-than-ideal efficacy rate and uncertainty regarding an efficacious mandibular position, pointing to the need for a tool to assist in delivery of the therapy. The current study assesses the ability to prospectively identify therapeutic responders and determine an efficacious mandibular position.

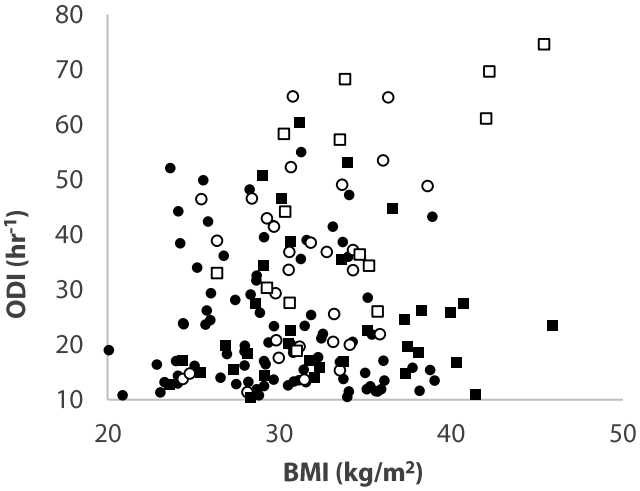
METHODS

- Individuals (n=202) with OSA participated in a blinded, 2-part investigation
- A system for identifying therapeutic responders was developed in part 1 (n = 149); the predictive accuracy of this system was prospectively evaluated on a new population in part 2 (n = 53)
- Each participant underwent a 2-night, in-home FCMP test, followed by treatment with a custom oral appliance and an outcome study with the oral appliance in place
- A machine learning classification system was trained to predict therapeutic outcome on data obtained from FCMP studies on part 1 participants. The accuracy of this trained system was then evaluated on part 2 participants by examining the agreement between prospectively predicted outcome and observed outcome.
- A predicted efficacious mandibular position was derived from each FCMP study

RESULTS

	Predicted Success	Predicted Failure	
Therapeutic Success	29	5	**Sensitivity = 85.3%** **PPV = 96.7%**
Therapeutic Failure	1	13	**Specificity = 92.9%** **NPV = 72.2%**





- Predicted protrusive position was efficacious in 86% of participants correctly predicted to respond to therapy
- Dashed line indicates median efficacious protrusive position
- Shaded area at 70% protrusion highlights number of participants who would be over-protruded based on common titration protocols that begin at 70% protrusion

Therapeutic Success (ODI<10hr^{-1}) ●part 1; ■ part 2
Therapeutic Failure (ODI>10hr^{-1}) ○part 1; □ part 2

- 68.3% of individuals with BMI >30 kg/m^2 and 52.5% of individuals with baseline ODI >30 hr^{-1} experienced therapeutic success (part 1 and part 2 combined)

CONCLUSIONS

- An unattended, in-home FCMP test prospectively identifies individuals with OSA who will respond to oral appliance therapy and provides an efficacious mandibular position

ZEPHYR Sleep Technologies