RESEARCH LETTER

Developing a Novel Speech Intervention iPad Game for Children With Cleft Palate: A Pilot Study

Children with cleft palate (CP) require multidisciplinary care, including palatoplasty and speech therapy (ST). There is currently an unmet need for ST for children with CP in resource-poor and rural areas owing to financial burden and shortages of transportation and health care professionals.1 Poor speech in these children, compounded by the aesthetic stigmata of cleft lip and/or palate, can have social and economic consequences in adulthood.

Speech therapy is needed in up to 68% of children with CP, often for compensatory articulation errors such as the glottal stop, where the vocal folds adduct as a substitution for high-pressure, oral plosives.2,3 Therapy includes establishment of target sounds, generalization of the new habits, and maintenance at home.3 Our study tested the feasibility and replay value of a game-based supplementary speech tool that is designed to augment office-based therapy by engaging parents and children in underserved areas.4,5

Methods | Ten children with CP and/or a cleft lip (aged 2-7 years) were identified as needing ST between May 29, 2013, and July 26, 2013. Children with cognitive impairment or profound hearing loss were excluded, as they needed to complete audio commands. The University of California, Davis, Institutional Review Board approved this study. Written consent was obtained from the children’s parents.

Software engineers, surgeons, and speech-language pathologists (SLPs) developed this interactive speech program for the iPad (Apple Inc). The game requires the child to produce targeted phrases to guide the main character through adventures by following on-screen prompts. The first speech commands were chosen to function with the speech recognition software (SRS) (OpenEars; Politepix UG) and to target the plosives /p,t,k/, which are erroneously spoken in glottal stops.3 The game is designed to provide carry-over of the plosive skills, which were introduced in face-to-face ST.

In a series of stories, the game software on Cocos2D (Apportable Inc) produces the target phrase for the child to repeat. The SRS converts the child’s speech into discrete sounds. If the target words are pronounced incorrectly, they are highlighted on the screen and the child has another opportunity to pronounce them (Figure).

The SLP rated the child’s speech using the standardized speech assessment protocol before initiating the game. The
Results | Ten children were enrolled in the study (Table). Mean (SD) game completion time was 164.3 (50.5) seconds. Every child completed the game storyboards with the designed repetition. Speech recognition was correct on the first attempt in 3 of 5 target phrases (“Put on boots,” “Wear a hat,” and “Cross the bridge”) and on the third attempt for the other 2 phrases (“Pop a balloon” and “Open the door”). There was high concordance between the game and real-time SLP scoring of responses.

Parental responses regarding the child’s engagement, replay value of the game, appropriate difficulty (all but one parent), positive rewards, and clear goal of the game produced mean scores higher than 4. Mean scores were not significantly different among the parental responses (P = .30).

Discussion | This pilot study was designed to test the feasibility of a novel iPad game software as a supplemental ST tool that may improve generalization of accurate speech production in children with CP. The game completion time was reasonable and within the child’s attention span. Participant responses were effectively captured by the game’s SRS with high accuracy. The children correctly made speech adjustments to trigger the game to move ahead to the next screen. Parents perceived the game as engaging, with high replay value, and noted better understanding of the ST strategies.

Future game improvements include an improved SRS, new game storyboards that are stratified for age, and Internet-based, real-time feedback for the SLP and child. As many of us experience with smartphones’ voice recognition weaknesses, some sounds do not match the system’s phonetic dictionary but are accurate enough to be understood by an observer. A blinded SLP will score the child’s videotaped speech samples from the gameplay to enable the system programming to narrow this gap.

Tsung-Yen Hsieh, MD
Jamie L. Funamura, MD
Christina Roth, MS, CCC-SLP
Zachary Rubin, BS
Sri Kurniawan, PhD
Travis T. Tollefson, MD, MPH

Author Affiliations: Department of Otolaryngology–Head and Neck Surgery, University of California Davis Medical Center, Sacramento (Hsieh, Funamura, Roth, Tollefson); Department of Computer Science, University of California, Santa Cruz (Rubin, Kurniawan).

Corresponding Author: Travis T. Tollefson, MD, MPH, Department of Otolaryngology–Head and Neck Surgery, University of California Davis Medical Center, 2521 Stockton Blvd, Ste 7200, Sacramento, CA 95817 (ttollefson@gmail.com).


Author Contributions: Dr Tollefson had full access to all the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis. Study concept and design: Hsieh, Funamura, Rubin, Kurniawan, Tollefson. Acquisition, analysis, or interpretation of data: Hsieh, Funamura, Roth, Rubin, Tollefson. Drafting of the manuscript: Hsieh, Rubin, Kurniawan, Tollefson. Critical revision of the manuscript for important intellectual content: All authors. Statistical analysis: Hsieh, Rubin, Tollefson. Obtained funding: Hsieh, Funamura, Rubin, Tollefson. Administrative, technical, or material support: Hsieh, Roth, Rubin, Kurniawan, Tollefson. Study supervision: Hsieh, Roth, Tollefson.

Conflict of Interest Disclosures: None reported.

COMMENT & RESPONSE

Importance of Understanding the Validity and Reliability of Visual Analog Scales for Rating of Personality

To the Editor As clinicians who have consulted and treated many patients with prominent ears, we read with great interest the article by Litschel et al1 because this is one of the few studies that have managed to quantify the attention-drawing potential of protruding ears and to measure the effect of protruding ears on the perception of personality traits.

However, we believe that the authors should have provided a greater explanation of the administration and use of the visual analog scales (VAS) for the rating of personalities in the study. This is because, to our knowledge, the VAS has not been used in any published studies for the purposes of personality rating. The authors1 have also not mentioned any reliability and validity tests for the use of VAS for the purposes as mentioned on the study.

Validity tests help to measure the quantities a study purports to measure, and reliability tests help to evaluate the consistency of the data received. Their evaluation helps to identify problems in the data collection methods, which could lead to erroneous results being produced and analyzed.2

The VAS is a tool that particularly needs a robust evaluation process because it has 2 major limitations: its requirement for the ability to transform a complex subjective experience into a visuospatial display, involving perceptual judgment and accuracy knowledge; and its requirement for detailed instructions to be provided to the participants of the study. Many physiological conditions have been reported to affect the acquisition of data from the VAS. Because the VAS is presented in a unidimensional format, if no good explanation is provided, it is also impossible to identify which dimension of the construct is being evaluated by the study participant. In the context of this study,1 the traits of sociability, contentment, assiduousness, intelligence, creativity, friendliness, successfulness, being exciting, accessibility, and honesty were being measured. We believe that these traits are highly abstract and are multidimensional (eg, intelligence can be defined as quantitative intelligence, whereas others might view it as artistic intelligence). The use of VAS to evaluate the perception of personality could hence lead to a high chance of respondent error and affect the results and conclusions reached by the study.

To allow the study to be interpreted and replicated by readers, we feel that the authors should provide the process whereby they have instructed the participants on the use of their VAS for personality rating. Statistical tests and results taken to evaluate the validity and reliability of their study device should also be shared.

Shunjie Chua, BEng
Mark Pitts, PhD
Peter Lemark, MBA

Author Affiliations: Duke NUS Graduate Medical School, Singapore (Chua); Duke University School of Medicine, Durham, North Carolina (Chua); Pritzker School of Medicine, University of Chicago, Chicago, Illinois (Pitts); Booth School of Business, University of Chicago, Chicago, Illinois (Lemark).

Corresponding Author: Shunjie Chua, BEng, Singapore General Hospital, Department of Dermatology, 20 College Rd, Academia Level 4, Singapore 169856 (chuashunjie@nus.edu.sg).

Published Online: July 2, 2015. doi:10.1001/jamafacial.2015.0078.

Conflict of Interest Disclosures: None reported.

Additional Contributions: We thank Jeff Ming Xuan Chua, BEng, of the Pritzker School of Medicine at the University of Chicago, for his support. We are also indebted to the education and supervision by our mentors at the University of Chicago and Duke University for their education and support.


In Reply We are thankful to Chua and colleagues for commenting on the methodology of our study “Effect of Protruding Ears on Visual Fixation Time and Perception of Personality,” in which we investigated the attention-drawing effect of protruding ears using an eye-tracking device and the effect of protruding ears on selected personality traits.

The chosen personality traits were derived from the validated Neuroticism-Extraversion-Openness Personality Inventory (NEO-PIR) questionnaire published by McCrae and John,1 representing the so-called big 5 personality traits. We added 4 more traits that have been used in previous research.2

The participants were instructed how to rate the personality traits on a visual analog scale (VAS). It is correct to mention that the questionnaire used in our study was not validated.

We also agree that the tested traits were abstract and multidimensional, making it difficult to judge a personality using the 10 pairs of antipodes we chose. Measuring personality was not the main objective of our study. Rather, we aimed at detecting differences in the rating of attributes that are related to personality. Obviously, validation of the questionnaire we used would have corroborated our findings. Still, a VAS may be of good use in similar settings.3 Despite all methodological limitations, some of which we discussed in the article and others that have been rightfully brought to our attention by Chua and colleagues, we consider our findings to be a stimulus for further research.

Ralph Litschel, MD
Abel-Jan Tasman, PhD