

# SpeakMore: A Mobile App towards Better Stuttering Awareness to Improve Speech Therapy

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**Abstract** - Generalization of treatment is a challenging task for speech therapists and adult who stutter (AWS), and it can contribute a barrier to long-term treatment success. Given that AWS often are aware of their speech problems at different speaking situations, self-evaluation of their own speech performance in real-life communication situations could be used to control their stuttering. This project aims to develop a mobile application for smartphones, SpeakMore, directed to AWS and speech therapist usage. This software will allow the AWS to register their stuttering related situations, self-evaluate their anxiety level and fluency level. It could help to promote daily self-monitoring of speech as a means of controlling stuttering. This system also allows speech therapists to monitor, receive report, and score their client's speech performance. This collected data could use to improve the therapeutic process using their client's personalized real-life communication situations.

**Keywords:** Stutter, Speech Therapy, Mobile Application

## 1 Introduction

Stuttering is a speech disorder which affects the capacity to communicate effectively. Anxiety has been recognized as a significant concomitant of stuttering [9], [10]. Adults who stutter (AWS) frequently reported increased stuttering in real-life communication in comparison with clinical setting [1], which is why standardized assessment and treatment is vital element in treatment plans to track the progress of AWS in both within and beyond clinical setting. For individuals with stuttering, the existence of speech associated negative emotion and anxiety is often the reason why they seek for speech therapy [11]. In fact, stuttering behaviors can vary across situations, listeners, time, making the process of obtaining a valid measurement complicated [2]. Therefore, repeated assessment (before, during, and after treatment) are important for stuttering treatment [3], [4]. Many speech therapists (STs) faced an issue of continuously assessing the patients due the lack of tools that allow STs to analyze their client's stuttering situations recorded immediately after a real-

life communication situation, so it hampers the therapeutic process.

Because of the increasing popularity of mobile apps and social games, many researchers use them to solve problems [5]. Many mobile apps are currently available for delivering advice and therapy. Some apps, like *Optimism*, *PTSD Coach*, *SuperBetter*, are designed for people with depression and anxiety. Some apps, like *Gottman Apps*, offer relationship advice. Some apps, like *MediSafe*, offer medication management service. Besides, a number of previous studies examined the content of apps for mental health management [6], [7]. In 2014, Lee Ventola pointed out that "Mobile devices and apps provide many benefits for Health Care Professionals, perhaps most significantly increased access to point-of-care tools, which has been shown to support better clinical decision-making and improved patient outcomes" [8]. To the best of our knowledge, there is no previous work on developing mobile apps for stuttering treatment.

One of the intervention techniques that has potential to improve current speech treatment for AWS but has not been incorporated into speech therapy, is the self-monitoring strategy. In this paper, we propose "*SpeakMore*", which is a mobile app for better stuttering awareness to improve speech therapy. The mobile app can be used by both STs and AWS to assess and self-monitoring (aka self-evaluating) the fluency of speech for individuals with stuttering. The STs who are familiar with smartphones can strengthen ties with clients and extend treatment to their daily lives using the proposed mobile app.

## 2 Mobile App: SpeakMore

In this section, we present the design overview and system implementation of the app, *SpeakMore*.

### 2.1 Design Overview

The purpose of the app, *SpeakMore*, is to (1) assess stuttering severity and 2) assess speech-anxiety levels during

real-life situations by AWS themselves (self-evaluating). This application for smartphones could provide a platform for AWS to register their stuttering related situations and record the anxiety level that they faced when stutter. The ability to self-monitor their stuttering events, rate their fluency level, and anxiety level towards the real-life daily communication provides a chance for the AWS to self-reflect their communication abilities. This could guide them to use the fluency techniques that they have learned at the clinic and generalize to the daily life. Additionally, this application provides a platform for the STs to provide real-time assessment of their client's speech performance, understand their client's anxiety level at different speech situations, track their client's speech performance, and provide feedbacks to the client.

Fig. 1 shows the system's architecture, which consists of 2 parts: (1) Android app for collecting input from patients and STs; (2) system server for storing input from patients and therapists in a centralized database. Besides, the data analysis can also be done at the system server. All patients, therapists and system administrators have an Android phone with our app installed. The system server is based on MYSQL as central data storage for ease of communications between the patient and the therapist.

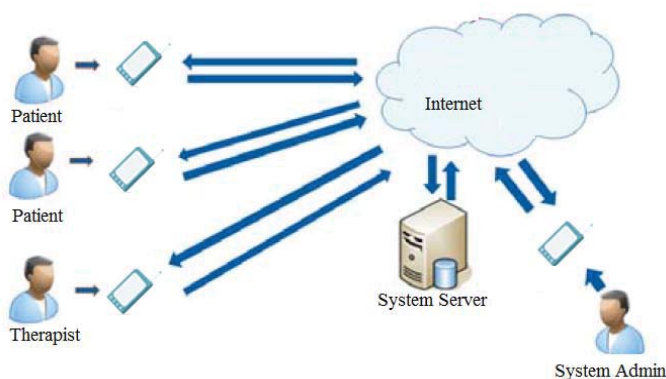


Fig. 1. System architecture

This is a 2-way system: (1) Patients use an Android phone to record video/speech and send the conversation (in different situations) to the server for storage. Patients will rate their fluency of speech, and anxiety level by themselves, and these ratings are also stored in the data server. (2) STs use an Android phone to download the video/speech (3 minutes) from the data server and judge the percentage of stuttering, fluency rating, and feedback. All these data will be sent to the centralized data server and then sent to the patient later.

## 2.2 How to Communicate using SpeakMore

Therapists (STs) can continuously assess the patients after a real-life communication situation by using our app *SpeakMore*. Fig. 2 shows how *SpeakMore* and its server help patients and therapists to communicate. By using *SpeakMore*,

patients can record a real-life communication situation and upload to the server via *SpeakMore*. Once the server receives a new record, it will send out a notification to therapist. Since each therapist have many patients, therapists can download the record at any time they like. Once therapists send their feedback to the server, the server will send out a notification to patient.

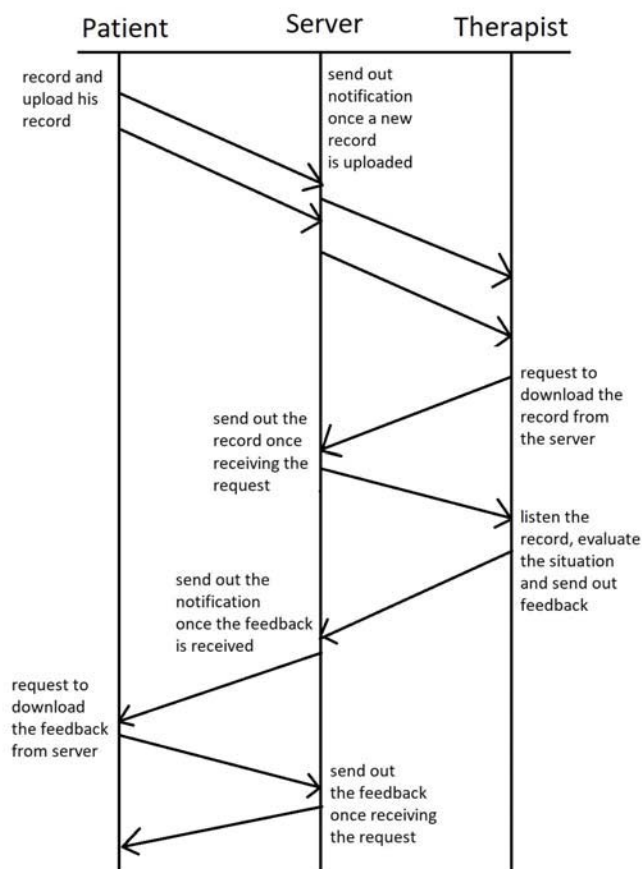
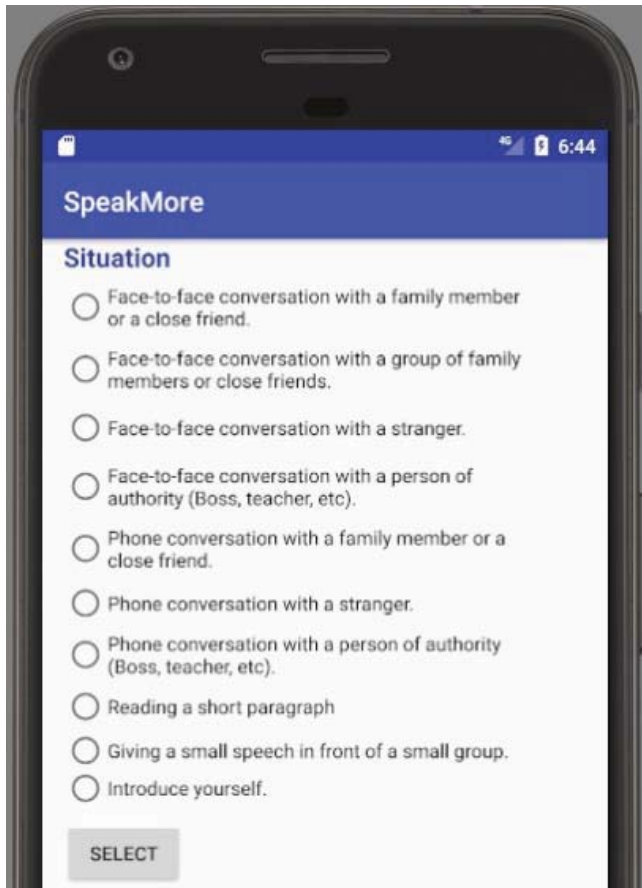


Fig. 2. How to communicate using SpeakMore

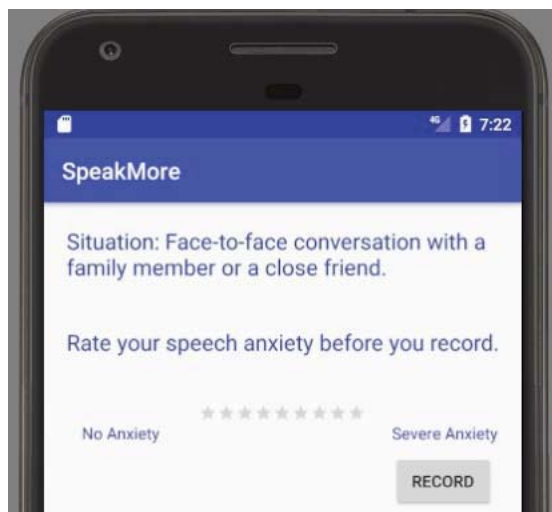
## 2.3 Implementation of SpeakMore

Before using *SpeakMore*, users need to register and log in as either patient or therapist. The functions offered to patients and therapists are different. Fig. 3 shows the interfaces of *SpeakMore* for patients. First, a patient chooses the situation of his recording as shown in Fig. 3(a). Suppose the patient selects the first option, which is “face-to-face conversation with a family member or a close friend”. The patient needs to rate his speech anxiety before recording as shown in Fig. 3(b). Once finish recording, the patient needs to rate his anxiety and also listen back his recorded speech to self-evaluate on the level of stuttering as shown in Fig. 3(c). When save button is pressed, all data are sent back to the system server.

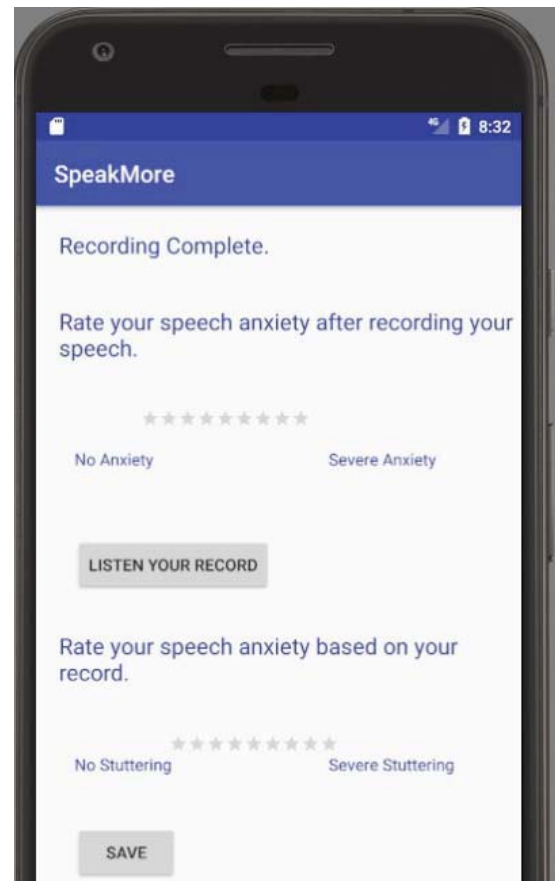
Fig. 4 shows the interface of *SpeakMore* for therapists. Once a pop-up message is received by the therapist, he can use *SpeakMore* to download the client's speech and rate the level of stuttering as shown in Fig. 4, and the rating input by the therapists is also stored in the system server.



(a)



(b)



(c)

Fig. 3. Overview of the interface of adults who stutter

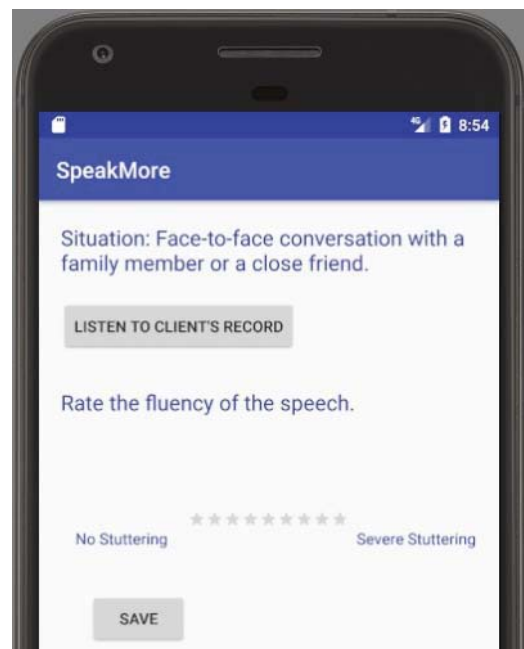


Fig. 4. The interface of the therapist

### 3 Conclusions

In this paper, we build a mobile app, *SpeakMore*, towards better stuttering self-evaluation in order to improve speech therapy. This mobile app could benefit both STs and AWS because it offers a module for the ST, which can monitor and receive reports related to their clients continuously. This collected data could improve therapeutic process. It could help to promote daily self-monitoring of speech as a means of controlling stuttering. Besides, the mobile app will allow users to self-monitor their stuttering related general condition, and eventually realize how they are evolving throughout treatment. In the future, we will carry out user experience evaluation in real clinical situations to evaluate the content of the mobile app.

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