Splash: Speech and Language Assessment in Schools and Homes

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Abstract

This paper presents a tablet-based app for Speech and Language Assessment in Schools and Homes (*Splash*) to provide a first screening for young children aged 4-6 years to assess their speech and language skills. The app aims to be easy-to-administer with an adult, such as a teacher or parent, directing the child through the tasks. Three fun games have been developed to assess receptive language, expressive language and connected speech, respectively. Currently in proof-of-concept mode, when complete Splash will use automatic spoken language processing to give an instant estimate of a child's communication ability and provide guidance on whether to speak specialist support. While not a diagnostic tool, the aim is for Splash to be used to provide immediate reassurance or direction to concerned parents, guardians or teachers as it can be administered by anyone, anywhere.

Index Terms: speech disorders, screening app

1. Introduction

The Speech and Language Assessment in Schools and Homes (*Splash*) app is motivated by the desire to detect children who may be at risk of speech and language difficulties early so they can get help. There are insufficient speech and language therapists to assess all children in the UK so Splash is aiming to act as a screening app for use at home or school by non-specialists to detect children who would benefit from more focused testing. We are aiming to build an easy-to-use app which is professional but welcoming, fun for the children yet serious in its purpose. It must appeal to parents, guardians and teachers who will help the child being screened work through the app. This paper will present our proof-of-concept app which runs in a web browser and is designed to be used on a tablet.

Around 6-10%of young children may suffer from a paediatric speech problem [1, 2]. Individuals who have these type of difficulties are over represented in mental health services, the long term unemployed and those who have poor educational attainment [3, 4]. Identifying children who have speech and language difficulties is therefore an increasingly important topic for affected children and families, policy makers, clinicians and educators alike. Increasing screening would allow both early intervention by speech and language therapists and help put the minds of parents at ease whose children are found to not need assistance.

The Splash app builds upon the PhD work of Mirawdeli, supervised by Howell [5, 6, 7]. Novel automatic assessment methods for early identification of children with language and speech difficulties including dysfluencies (such as stuttering) or phonological disorders (such as inconsistent or inaccurate production of sounds to make meaningful contrasts in words, for example saying "tat" instead of "cat"). There are 3 games which en-courage the child to provide assessment data whilst having fun, guided by an adult who could be a parent or teacher etc. As the screening will be done on young children, aged 4-6 years, we cannot assume they can read so the app is image rich with no words being presented to the children. The test games are described in more detail in the next section with the Receptive Test animated in the supplementary video.

2. App modules

The Splash app will consist of the following modules initially:

1. **Overview**: introduction, who we are, basic terminology, scientific motivation and validity

2. **Registration**: collect information about child

3. **Receptive Test**: comprehension assessment

4. **Expressive Test**: speech sound production assessment

5. **Connected Speech Test**: connected speaking assessment

In the proof of concept stage the app finishes by thanking participants for taking part. When the assessement has been automated a Results Feedback stage will be added which will present information to the supervising adult on how the child has performed and whether further action should be taken.

The app is planned to be used on a tablet but as it has been implemented as a web application it is relatively device neutral.

2.1. Receptive Test

The Receptive Test checks a child's comprehension. To test their sentence comprehension they are shown a set of 4 pictures and hear a sentence describing one of the 4. The child has to click on the picture which matches what they have heard. The images and sentences start off very simple, for example "A yellow star" with Figure 1. They become progressively more complex, for example "A small basket is full of apples" with Figure 2. In the second part of the test a single word will be played to test their word or vocabulary comprehension.

2.2. Expressive Test

The aim of the Expressive Test is to elicit a range of different speech sounds from the child. They are asked to produce a single word corresponding to a picture of an item. The emphasis is on collecting the sounds that the child produces. For example, word initial sounds e.g. /b/ in "banana" (Figure 3), /k/ in "cat", and consonant cluster sounds e.g. /p l/ in "plate", /g r/ in "green".
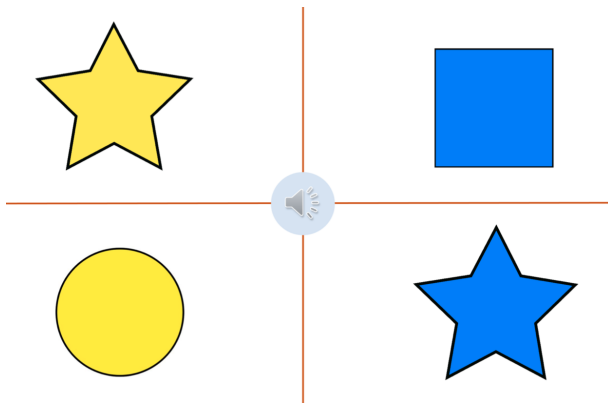
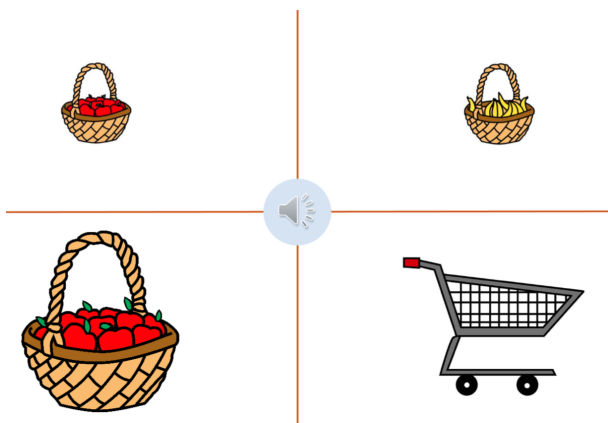Figure 1: *Example of simple pictures used in Receptive Test.*

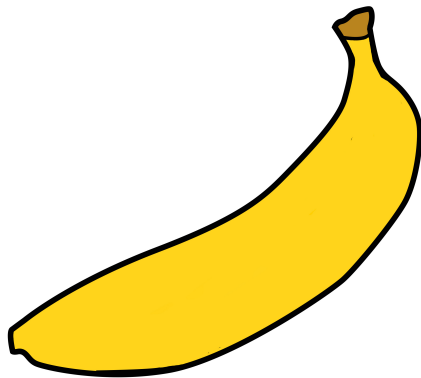Figure 2: *Example of more complex pictures used in Receptive Test.*

Figure 3: *Example of Expressive Test picture.*

2.3. Connected Speech

The child is shown a complex scenario-based picture such as in Figure 4. They are asked to describe the picture in as much detail as possible. To encourage the child, the adult can direct the child for example, to describe what each animal is doing, or how the animals are feeling. The adult might ask the child to describe the colours, foods and animals they can see. There are 5 pictures the child can choose from. To get sufficient data to assess the child's speech they will need to talk for a minimum of 250 syllables [6]. The App will aim to let the adult and child know when they have provided enough speech.

Figure 4: *Example of image used in Connected Speech test.*

3. Conclusions

This paper has presented an app, *Splash*, designed to allow easy-to-administer screening of young children aged 4-6 years for speech and language disorders. The app is in proof-of-concept mode and can be used for data collection and offline assessment. In the future automatic spoken language processing running in the cloud will be added to provide instant information and feedback to parents, guardians and/or teachers.

4. Acknowledgements

5. References

[1] J. Broomfield and B. Dodd, "Children with speech and language disability: caseload characteristics," *Int. J. Lang. Commun. Disord.*, vol. 39, no. 3, pp. 303–324, 2004.

[2] P. Howell, *Recovery from Stuttering*. New York: Psychology Press, 2010.

[3] J. Bercow, "The Bercow Report: A review of services for children and young people (0-19) with speech, language and communication needs," Nottingham, 2008.

[4] ——, "Bercow: Ten years on," 2018. [Online]. Available: https://www.bercow10yearson.com

[5] A. Mirawdeli, "Assessing speech fluency problems in typically developing children aged 4 to 5 years," Ph.D. dissertation, University College London, 2017.

[6] A. Mirawdeli and P. Howell, "Is it necessary to assess fluent symptoms, duration of dysfluent events, and physical concomitants when identifying children who have speech difficulties?" *Clinical Linguistics and Phonetics*, vol. 30, no. 9, pp. 696–719, 2016.

[7] A. Mirawdeli, "Identifying children who stutter or have other difficulties in speech production in school reception classes," *Procedia - Social and Behavioral Sciences*, vol. 193, pp. 192–201, 2015.