# User Acceptance of 'Let's Talk Now' Mobile App for Dysarthric Children

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**Abstract**—Dysarthria is a neurological disorder that damages of motor speech articulation. Young children who suffered from this disorder have no problem with their cognition, but they have difficulties to speak out their words. They could not have an accurate and smooth communication with their family and friends due to this disorder. Therefore, the purpose of this study is to investigate the user acceptance of an interactive speaking tool in the form of a mobile application named 'Let's Talk Now' which was designed with redundant multimedia elements for the use of dysarthric children aged 3 to 7 years old. This mobile appwas designed and developed as an early intervention to help the dysarthric who are facing problem to communicate and enable them to be understood by others. It focuses on daily usable conversation terms for family, greeting and expressions, places, ordering food and beverages, activities and asking for help. This study involved 15 respondents who are related to dysarthria namely therapists, parents, and teacher of dysarthric children. The 'Let's Talk Now' mobile app's acceptance was evaluated using the USE (Usefulness, Satisfaction and Ease of Use) Questionnaire (Lund, 2001) which was used to measure its user acceptance. The findings described that all of the respondents agreed that the 'Let's Talk Now' mobile app is usable and suitable in helping the communication between dysarthric children and people.

**Keywords**—Dysarthria, Let's Talk Now, mobile app, children, early intervention, speech, communication, multimedia

## 1 Introduction

Speech disorder has a large impact on the life quality; it reduces the capacity to express personality, exercise autonomy and often has an impact on relationships and self-esteem [29] especially for young children. These children suffer with the communication problem and even through by using hand gesture, they still could not send the messages accurately and correctly to other people. Among the main disorder that affected them are dysarthria. Dysarthria is a neurological disorder that damages of motor speech articulation [15][39]. It is a motor speech disorder that affecting millions of children [43] by causing language alteration produced by a brain lesion [16]. A

dysarthric child has much difficulty in communicating, as this disorder induces bad or no pronounced phonemes and poor speech articulation [45]. In other words, it is a condition in which problems effectively occur with the muscles that help produce speech, often making it difficult to pronounce words [45]. There are many types of dysarthria depending on the area of the nervous system affected, however, all types affect the articulation of consonants and vowel, causing of slurring of speech [26]. These syndromes can only be detected before 3 years old in natural born [36].

To address this disorder, several speech-based assistive technologies and techniques such as Automatic Speech Recognition (ASR), Synthesis of Dysarthria Speech, Concatenation Algorithm, Grafting Technique, TORGOMorph System, and ALADIN, have been developed for users with dysarthria based on the severity level [26]. However, these commercial speech recognition technologies are still not easily employed by individuals who have speech or communication disorders [46] especially affected children and their caregivers. This is because these speech assistive technologies are tools that facilitate the recovery of the dysarthric patients and it does not help the affected children to communicate at the initial stage. It can be time consuming, especially when phono-articulatory dynamics of the assistive technology are complex even for grown-ups. In most cases, it affects the children's motivation for recovery and diminish their effect to be independent. The children get frustrated as the initial attempt for them to communicate fails, as their family and friends still are unable to understand their speech, and this demotivate them to try the complicated therapies and techniques further.

Speech assistive technologies that are used as an early intervention aid for children should be implemented through a family-centered approach as the intervention will be carried out by the parents or caregivers [38]. These initial approaches entail providing a context of emotional support to the children and also promote the child's communicative development throughout everyday routines [38]. This will increase their motivation to articulate speech and encourage them to produce sounds with their own voice and engage them in the other assistive technologies that can help them to recover.

Therefore, an early intervention of customized multimedia-based assistive technology aid in the form of mobile application named 'Let's Talk Now' was designed and developed to assist the dysarthric children to communicate at home or their peers independently. It is an effort to motivate them to articulate speech and encourage them to produce sounds with their own voice. This mobile app functions as an early intervention that will help them to engage in the other assistive technologies that can help them to recover. And this research attempts to investigate the user acceptance of the developed mobile application as an early speech assistive multimedia tools that will help the communication of the dysarthric children at home or with their family independently.

## 2 Dysarthria Disorder

Dysarthria is a type of motor speech disorder where normal speech is disrupted due to loss of control of the articulators that produce speech [1]. It is a set of congenital and traumatic neuromotor disorders that impair the physical production of speech [15]. These impairments reduce or remove normal control of the primary vocal articulators but do not affect the regular comprehension or production of meaningful, syntactically correct language. Cerebral palsy is found to be among the most common of dysarthria [39]. Cerebral palsy is not a disease, but it is a disorder which is effected on movement while the patient has limited activity and affected from brain damage. In detail, dysarthria is a speech disorder due to a brain, nerve or muscle damage resulting in lack of control of the muscles of tongue, mouth, larynx or vocal cords that produce speech [19]. The muscles may be weak, completely paralyzed, or the coordination between them might have failed. The speech of dysarthric patients is poorly audible, improperly pronounced, or without any rhythm or speed and of very poor quality [19]. This disorder can be detected before a child is 3 years old [36]. The children who have this disorder are able to understand conversations, but they have difficulties to speak out their words.

Research on dysarthric patients show that a lack of tongue and lip dexterity often produces heavily slurred speech and a more diffuse and less differentiable vowel target space [41]. The lack of articulatory control often leads to various involuntary sounds caused by velopharyngeal or glottal noise, or noisy swallowing problems [40]. Dysarthric speech can be up to 17 times slower than regular speech, at about 15 words per minute in severe cases [35] and this can be laborious for the speaker and listener. A person with dysarthria may experience any of the following symptoms [44], depending on the extent and location of damage to the nervous system:

- "Slurred" speech
- Speaking softly or barely able to whisper
- Slower rate of speech
- Rapid rate of speech with a "mumbling" quality
- Limited tongue, lip, and jaw movement
- Abnormal intonation (rhythm) when speaking
- Changes in vocal quality ("nasal" speech or sounding "stuffy")
- Hoarseness
- Breathiness
- Drooling or poor control of saliva
- Chewing and swallowing difficulty

People with dysarthria have full understanding of languages and know what they want to say but just have trouble actually saying it [44]. Since dysarthria cannot be cured with surgery or medication [30], it is a huge source of frustration for the individual and without treatment can be quite detrimental to confidence and self-esteem levels. Therefore, early intervention in the form of speech and language therapy is recommended [5] and behavioural interventions involving computer-based assistive tools are often used to help the dysarthric patients [41].

## 3 Speech Assistive Technology (SAT)

Assistive technology refers to the devices and services that are used to increase, maintain, or improve the capabilities of a person with a disability [12]. Consequently, speech assistive technology addresses the need of people with communication disorders, and could assist a significant proportion of them to interact more with their surroundings [24]. Fortunately, advances in computer and multimedia technology have led to the creation of specialized assistive tools that help make it possible for individuals with no speech, or individuals with poor speech, to overcome their communication problems [4]. It is designed to support or enhance the speaking capability of a speech disabled person [24].

The SAT vary in terms of their portability, complexity, input method, vocabulary representation format, and means of output delivery [17]. Selecting an appropriate system must be tied to the needs and capabilities of the user especially if it involves children [14]. Today, many SAT has incorporated either synthetic or digital speech output. Synthetic speech is artificially generated by the computer, while digital speech is an actual recording of human speech stored in the memory of the device. Clearly, SAT can be extremely powerful tools for individuals with speech and language disorders.

Research suggests that if a child has been detected to have speech disorder such as dysarthria, the caregivers should not wait and immediately start with an early intervention of Speech Assistive Technology as the developmental language deficits do not disappear with age [14]. These disabilities develop into permanent deficiencies with severe long-term consequences such as problems at school (reading, writing and spellings), difficulties to understand tasks with language related contexts, behavioral abnormalities and emotional problems. Hence it is essential to intervene early because the early intervention services using simple and user-friendly speech assistive technology enhance child development [2].

Intervention research suggests that the rate of human learning and development is most rapid in the first five years of life [2]. Early skill development is crucial to laying the groundwork to increase the child's developmental and educational gains, increasing his or her eligibility for future employment and self-sufficiency. These interventions also assist parents and siblings, helping them deal with feelings of stress or helplessness, while learning to maintain a positive attitude.

There are many types of assistive technology tools that are available for use by individuals who have speech impairments; low tech, mid-tech and high-tech. The low-tech assistive technology for speech impairments uses paper, plastic or similar materials such as simple picture/word board or cards, eye-gaze picture board, visual scheduler or planner or adapted pens/pencils. It is usually low cost, portable, personal, readily acceptable by the user and no need for a power supply. The mid-tech assistive technology uses batteries for voice, text, or light output such as on/off light devices, "Wrist communicator" (eg. with 2-10 stored vocal outputs), keyboard with display or printer, and scanning light board (eg. with pictures). The advantages of these types of assistive technology are that it is low-to-moderate cost, usually portable, personally owned, needs moderate training and occasionally can use for limited long-distance

communication. As for the high-tech devices, it requires microcircuits and microcomputer technology such as adapted laptop computers with commercially available voice over and dynamic displays, touch pads or keyboards or individualized devices that use special inputs (eg. eye blinks).

The use of speech assistive technology offers opportunities for research into the interaction of people who are nonverbal (because of a disability) with those who are able to speak. Children with disabilities can benefit considerably from assistive technology, perhaps sometimes more than adults with similar problems, because assistive technology can help to maximize children's developmental potential [4]. Their ultimate success, however, depends on the early intervention tools they are given as children [14] and the families must be involved in the assessment and intervention process [27].

## 4 Multimedia Based Assistive Technology for Speech Impairment

Various multimedia based assistive technologies (MAT) have been developed and used to assist speech impairment [38]. Speech based MAT (SMAT) systems/ application are used to establish functional communication when natural speech methods are insufficient to achieve daily communication goals and meet communication needs [4]. It employs hardware and software to produce visual output, that is, digitally displayed messages (i.e., dynamic or static displays) or voice output (verbal messages). There are two versions of SMAT; verbal based and visual based. The verbal-based allows the user to spell letter-by-letter, using symbols to represent words and messages, sequencing icons to represent words and messages, selecting individual words from a display to generate word-by word messages, and selecting partial and full messages that have been programmed and stored [4]. The visual based SMAT may two-dimensional symbols that can represent other items, tangible objects, textures, picture symbols, and orthographic symbols (e.g., alphabet, Braille) [4].

SMAT describes various methods of communication that are used to get around problems with ordinary speech. It includes simple systems such as pictures, gestures and pointing, as well as more complex techniques involving powerful computer technology [8]. SMAT systems/ applications are used is used to help speech impaired people to express themselves as they find communication difficult because they have little or no clear speech [8]. Most of the high-tech SMAT systems/applications can speak and/or produce text. They range from simple buttons or pages that speak when touched, to very sophisticated systems. Some high-tech communication systems are based on familiar equipment such as mobile devices, tablets and laptops, others use equipment specially designed to support communication [8].

The existing SMAT systems can be categories into five types (i) speech recognition system, (ii) hands-free control system, (iii) sign language visual synthesis, (iv) text to speech, and (v) 3d animation (avatar, pedagogical agent etc.) [7][11][37]. In normal condition, children with speech impairment such as dysarthria use alternative communication modes such as manual sign and visual symbols, which is a substitution

for spoken words [42]. However, most of the existing SMAT include speech recognition elements [18] or text input. Young children who already having difficulty in pronouncing clearly and does not know alphabets, find it impossible for these systems to assist them. Furthermore, the existing SMAT systems/ application is complex and modelled for adults with dysarthria [36]. This is because the speech interventions for adults involves rehabilitating a speech system that was once intact [36], whereas treating children involves treating a developing motor control, speech sound, cognitive, and linguistic system [22]. Unlike many adults who have acquired dysarthria after childhood, children with dysarthria are likely to have phonological and language deficits, along with their speech (and sometimes cognitive) deficits [21][25]. Not only that, the existing SMAT are designed to be handled by an adult and tools that facilitate the recovery of the speech impaired patients [46] and it does not help the children to communicate at the initial stage. It needs supervision of the therapist and caregivers to facilitate the intervention for these children and it is not for early intervention. [36], in their research, argued that for a better recovery, the children will have to be exposed to the intervention independently at an early stage.

## 5 Design and Development of 'Let's Talk Now' Mobile App

Let's Talk Now mobile app was designed and developed as an early intervention to help the dysarthric children aged 3 to 7 years' old who are facing the problem to communicate and enable them to be understood by others [47-48]. This app focuses on daily usable communication terms such as to call family members, for greetings and expressions, to mention places, to order food and beverages, to mention activities and to ask for help. It was designed and developed based on the ADDIE (Analysis, Design, Develop, Implement and Evaluate) Model. Figure 1 illustrates the flow of the design and development process.

The lesson content for this mobile app was developed based on the Special Children Curriculum syllabus that was provided by the Special Children Care Centrein Malaysia. It's developed using Adobe Animate software and is very consistent in term of all the mobile application features such as menu, buttons, labels, wording and the interface format. The user interface of the 'Let's Talk Now' is designed using the appropriate color, font and graphics which is suitable for children aged 3 to 7 years old. It has 6 menus as each menu represented terms related to the aspect and it is employed with the redundancy of multimedia elements such as text, narration, background music, graphics and animation. This application has narrations using the voice of a small child as its speech and language elements to represent the dysarthric children and help them to communicate. In order to install this application, it required 301MB storage size and Android version 6.0 and above. It is available in dual language; English and Mandarin, and it can be used without internet connection. The mobile application was not designed with assessment (exercise) as the purpose of this application is as an early intervention to help the dysarthric children to communicate and enable them to be understood by others. This mobile application was developed based on the family centered approach, by integrating the elements such as; i) early intervention, ii) assistive technologies for

children, iii) family approach, iv) speech and language elements. Let's Talk Now mobile app is expected to be an early intervention that is usable and suitable in helping the communication between dysarthric children and people and it also helps the dysarthria children to interact at the initial stage independently. Figure 2 illustrates the user interfaces of 'Let's Talk Now' mobile app.

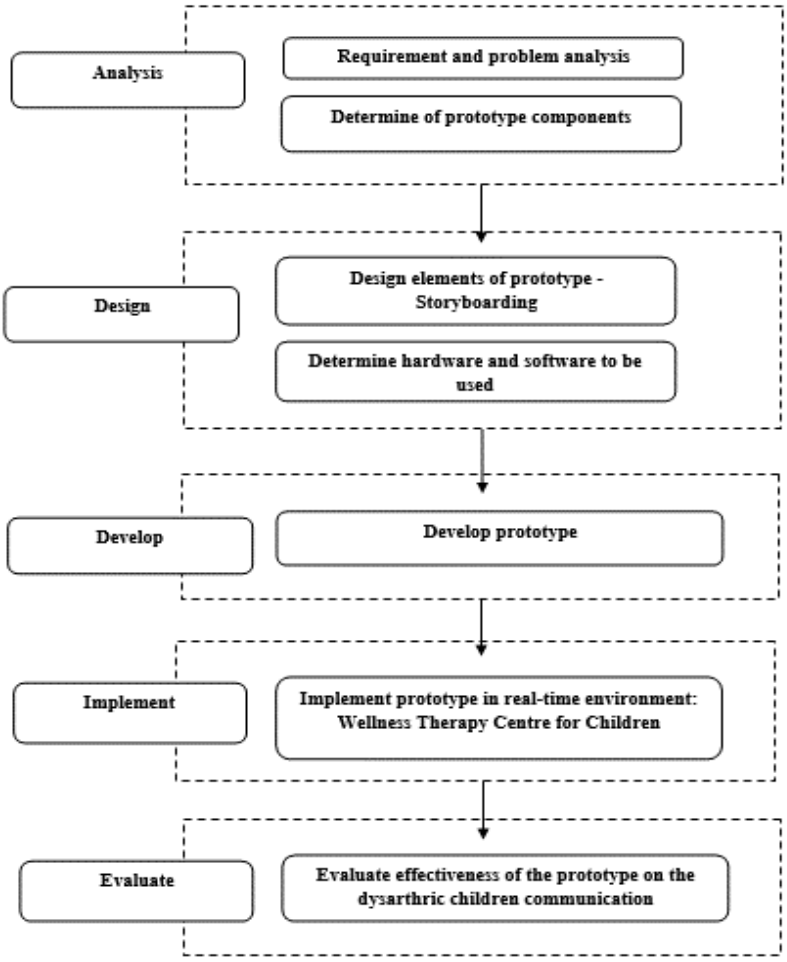


**Fig. 1.** The flow of the design and development process of 'Let's Talk Now' mobile app


**Fig. 2.** The interface of 'Let's Talk Now' mobile app (English Version)

There are two similar applications on the market for the users; Talking Pictures: Autism, CP and Speak CePal for Autism and CP. These applications are developed for the iOS operating system and it does not cater the Android users. Both applications are designed to facilitate communication with non-speaking children diagnosed with autism, mental retardation, and cerebral palsy. The Talking Pictures: Autism, CP has

images with sound that depends on the setting; either an alarm sound or speech synthesizer will speak the phrase that is set for that image; however, it does not have its own narration. Speak CePal for Autism and CP has limited option similar with the former.

## 6 User Acceptance of 'Let's Talk Now' Mobile App

This research attempts to investigate the user acceptance of the 'Let's Talk Now' mobile app that was developed to help the dysarthria children to communicate from the perspective of 15 respondents who is related to these children namely the therapists, parents, and the teachers of the dysarthric children. The researchers did not evaluate the dysarthric children themselves as it is very difficult for them to express their agreement or disagreement to the questionnaire as they are still young children. The respondents responded to the user acceptance evaluation after experiencing the mobile application together with the dysarthric children for a week.

This app was downloaded to the respondents' smartphones and tablets, and are instructed to be used together with the dysarthric children. Some of these children have normal movement and some of them are wheelchair bounded. In the latter case, the device is attached to the wheelchair. Prior to the intervention, the respondents are given one-day training on how to use the app and after the seventh day, the respondents evaluated the user acceptance aspects of the app. Three dimensions have been evaluated, namely usefulness, ease of use and user interface satisfaction. For this purpose, this study adapted the USE (Usefulness, Satisfaction and Ease of Use) questionnaire as the evaluation instrument. This questionnaire contains 30 statements that required the respondents toindicate their response, according to the rating of Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). The data collected were analyzed using parametric statistical method. Table 1 describes the constructs, items and its abbreviation used in the adapted USE questionnaire.

**Table 1.** The constructs, items and abbreviation used in the adapted USE questionnaire

| Constructs | Items | Abbreviation |
|---|---|---|
| Usefulness | It helps the child to communicate more effectively. | USE1 |
| | It helps the child to be more productive. | USE2 |
| | It is useful for the child. | USE3 |
| | It gives the child more control over the activities in his/her life. | USE4 |
| | It makes the things the child wants to accomplish easier to get done. | USE5 |
| | It saves the child time when he/she use it. | USE6 |
| | It meets the child needs. | USE7 |
| | It does everything I (as the child's caregiver) would expect it to do. | USE8 |
| Ease of Use | The mobile app is easy to use. | EASE1 |
| | The mobile app is simple to use. | EASE2 |
| | The mobile app is user friendly. | EASE3 |
| | The mobile app requires the fewest steps possible to accomplish what the child want to do with it. | EASE4 |
| | The mobile app is flexible. | EASE5 |
| | Using the mobile app is effortless. | EASE6 |
| | The child can use the mobile app without written instructions. | EASE7 |
| | I (as the child's caregiver) don't notice any inconsistencies as I use it. | EASE8 |
| | Both the child and the caregiver would like the mobile app. | EASE9 |
| | The child can recover from mistakes quickly and easily. | EASE10 |
| | The child can use the mobile app successfully every time | EASE11 |
| Ease of learning | The child learned to use the mobile app quickly. | LEARN1 |
| | The child easily remembers how to use the mobile app. | LEARN2 |
| | It is easy to learn to use the mobile app. | LEARN3 |
| | The child quickly became skillful with the mobile app. | LEARN4 |
| Satisfaction | I (as the child's caregiver) am satisfied with the mobile app. | SAT1 |
| | I (as the child's caregiver) would recommend the mobile app to a friend. | SAT2 |
| | The mobile app is fun to use. | SAT3 |
| | The mobile app works the way it supposed to. | SAT4 |
| | The mobile app is wonderful. | SAT5 |
| | I (as the child's caregiver) feel my child need to have the mobile app. | SAT6 |
| | The mobile app is pleasant to use. | SAT7 |

## 7 Findings

The purpose of this study is to investigate the user acceptance of the Let's Talk Now mobile app in assisting dysarthric children to communicate. 15 respondents who are related to dysarthria namely therapists, parents, and teacher of the dysarthric children responded to the adapted USE [49] questionnaire. Table 2 illustrates the descriptive analysis of the respondents' demographic information. The finding describes that 19 of the total respondents are female and 11 respondents are male. Majority of the respondents are parents of the dysarthric children, which occupied 50.0% (15 people), 7 of them are therapists and 8 respondents were teachers. Most of them were using tablets and the Android operating system is largely deployed.

**Table 2.** Descriptive analysis of the respondents' demographic information

| Information | | Distribution | Percentage (%) |
|---|---|---|---|
| Role | Therapist | 2 | 13.3 |
| | Parents | 9 | 60.0 |
| | Teacher | 4 | 26.7 |
| Gender | Male | 5 | 33.3 |
| | Female | 10 | 66.7 |
| Platforms | Android/ Google | 14 | 93.3 |
| | iOS | 0 | 0.0 |
| | Microsoft | 1 | 0.67 |
| Device | Smartphone | 2 | 13.3 |
| | Tablet | 13 | 86.7 |

Table 3 describes the statistical analysis of the user acceptance evaluation of the mobile app from the respondents' response measured by the adapted USE questionnaire.

**Table 3.** User acceptance evaluation mean analysis

| Constructs | Items | Therapist | Parents | Teachers | Total Mean | Construct Mean |
|---|---|---|---|---|---|---|
| Usefulness | USE1 | 4.50 | 4.44 | 4.25 | 4.40 | 4.36 |
| | USE2 | 4.00 | 4.56 | 4.00 | 4.33 | |
| | USE3 | 4.00 | 4.67 | 4.00 | 4.40 | |
| | USE4 | 4.00 | 4.22 | 4.00 | 4.13 | |
| | USE5 | 4.50 | 4.44 | 4.50 | 4.27 | |
| | USE6 | 4.50 | 4.33 | 4.25 | 4.33 | |
| | USE7 | 4.00 | 4.22 | 4.25 | 4.20 | |
| | USE8 | 4.50 | 4.78 | 4.25 | 4.60 | |
| | TotalUSE | 4.25 | 4.45 | 4.18 | | |
| Ease of Use | EASE1 | 4.00 | 4.67 | 4.50 | 4.53 | 4.43 |
| | EASE2 | 5.00 | 4.33 | 4.50 | 4.47 | |
| | EASE3 | 4.50 | 4.11 | 4.25 | 4.20 | |
| | EASE4 | 4.50 | 4.78 | 4.75 | 4.73 | |
| | EASE5 | 4.50 | 4.44 | 4.50 | 4.47 | |
| | EASE6 | 4.00 | 4.11 | 4.50 | 4.20 | |
| | EASE7 | 4.00 | 4.44 | 4.50 | 4.40 | |
| | EASE8 | 4.50 | 4.33 | 4.50 | 4.40 | |
| | EASE9 | 4.00 | 4.44 | 4.75 | 4.47 | |
| | EASE10 | 4.50 | 4.67 | 4.75 | 4.67 | |
| | EASE11 | 4.00 | 4.11 | 4.50 | 4.20 | |
| | TotalEASE | 4.32 | 4.40 | 4.55 | | |
| Ease of learning | LEARN1 | 4.50 | 5.00 | 4.50 | 4.50 | 4.57 |
| | LEARN2 | 4.67 | 4.56 | 4.56 | 4.44 | |
| | LEARN3 | 4.75 | 4.50 | 4.75 | 4.25 | |
| | LEARN4 | 4.67 | 4.60 | 4.60 | 4.40 | |
| | TotalLEARN | 4.63 | 4.56 | 4.56 | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| Satisfaction | SAT1 | 4.50 | 4.00 | 4.50 | 4.20 | 4.39 |
| | SAT2 | 4.50 | 4.56 | 4.75 | 4.60 | |
| | SAT3 | 4.00 | 4.56 | 4.75 | 4.53 | |
| | SAT4 | 4.00 | 4.44 | 4..75 | 4.47 | |
| | SAT5 | 4.00 | 4.44 | 4.25 | 4.33 | |
| | SAT6 | 4.00 | 4.44 | 4.50 | 4.40 | |
| | SAT7 | 4.50 | 4.00 | 4.50 | 4.20 | |
| | TotalSAT | 4.36 | 4.43 | 4.56 | | |

The first construct of the user acceptance evaluation is the usefulness aspect. The respondents acknowledged that the 'Let's Talk Now' mobile app helps the child to communicate and to be more productive. It is also useful for the child as it meets the child's need. It also gives the child more control over the activities in his/her life and it does everything I (as the child's caregiver) would expect it to do. Overall, the respondents stated that the Let's Talk Now mobile app is useful as the mean score for this construct is 4.36. All the therapists strongly agree that the developed mobile application is useful (mean= 4.25) while the parents responded that the mean value is 4.45 and the teachers claim that the usefulness's mean value is 4.18. The high mean scores for the first construct indicated that the mobile app is useful in helping the dysarthric children to communicate more effectively and meet the children's needs.

As for the ease of use construct, the respondents have remarked that the is easy to be used as it is simple. It only requires the fewest steps possible to accomplish what the child want to do with it. Both the dysarthric child and the caregiver like the mobile app and The child can use the mobile app successfully every time. The overall mean score for this construct is 4.43. The analysis suggests that the therapist scored a mean value of 4.32; parents stated 4.40 and the mean that the teachers' mean scores were 4.55. The respondents pointed out that the use of the evaluated mobile app effortless and easy. It only requires a few steps to accomplish what the dysarthric children want, and it is very user friendly. They also stated that the children are able to use the mobile app independently to communicate after practicing a few times.

The respondents also answered that it is easy to remember how to use the mobile app. The ease of learning construct projected an overall mean score of 4.57. The therapists recorded a mean score of 4.63 while parents claimed a mean score of 4.56. The teachers scored a mean of 4.56 as well. They implied that their child are able to learn to use the mobile app quickly.

For the satisfaction construct, the respondents agreed that as the dysarthric children's caregivers, they are satisfied with the mobile app and would recommend the mobile app to a friend. The feedback of the respondents also stated that the mobile app is fun to be used and works the way it supposed to. For this construct, the therapists responded the mean score at 4.36, the parents suggested 4.43 and the teachers implied that the mean score is 4.56. Overall, the respondents scored a mean score of 4.39 for the satisfaction construct indicating that they are satisfied with the mobile app and feel that their children need to have the mobile app.

All the mean scores for all the constructs which are more that 4.00 ($4.00<\bar{x}< 5.00$) indicated that the all the respondents strongly agreed that the 'Let's Talk Now' mobile app is useful, easy to be used, easy to be learned and they are satisfied with the design and function of the mobile application.

## 8 Discussion and Conclusion

Dysarthria is a motor speech disorder and if a child is affected by the dysarthria disorder, the child will face much difficulty in communicating especially at the early stage. Although, several speech-based assistive technologies and techniques have been developed for users with dysarthria, it is not easily employed and little has been done to assist the children who have this communication disorder in the early stage of experiment of recovery. In normal condition, children with speech impairment such as dysarthria use alternative communication modes such as manual sign and visual symbols, which is a substitution of spoken words, but most of the existing speech-based assistive technologies include speech recognition elements or text input, which is beyond the capability of these children. Dysarthric children who already having difficulty in pronouncing clearly and does not know alphabets, find it impossible for these systems to assist them. Furthermore, the existing systems/ application is complex and modelled for adults with dysarthria as it is designed as speech interventions for adults, which involves rehabilitating a speech system that was once intact. However, children with dysarthria are likely to have phonological and language deficits, due to the impairment of their primary vocal articulators because of the lack of control of the muscles of tongue, mouth, larynx or vocal cords that produce speech. Hence, the existing speech-based assistive technologies do not help the children to communicate at the initial stage and does not serve for early intervention and self-use of the children. It is suggested that at the initial stage, the speech assistive materials should be implemented through a customized family-centered approach. It should be an early intervention that will help the dysarthric children to communicate and enable them to be understood by others.

This research attempts to investigate the user acceptance of an early speech intervention named 'Let's Talk Now' mobile app which was designed with redundant multimedia elements for the use of dysarthric children aged 3 to 7 years old. The 'Let's Talk Now' mobile app was evaluated using adapted USE questionnaire. This questionnaire assessed the user acceptance aspects of the app in assisting the dysarthria children to communicate. This research involved 15 respondents who are related to dysarthria namely therapists, parents, and teacher of dysarthric children. The findings of the evaluation on the 'Let's Talk Now' mobile application implies that all the respondents agree that the appfit the intended task, which is to assist the dysarthria children to communicate and they believe that the 'Let's Talk Now' app should be used by their children. They also stated that they feel satisfied as the dysarthric children can use the 'Let's Talk Now' app on his/her own. Overall, the respondents accepted that the 'Let's Talk Now' mobile application is an early intervention that is usable and suitable in helping the communication between dysarthric children and people and it also helps the dysarthria children to interact at the initial stage independently.

Developing and maintaining proper communication skills is a mainstay for every individual to express needs, to learn, and, in general, to have the opportunity to participate as an active member of society. Individuals with communication difficulties are at a significant social disadvantage and this disadvantage often affects a person's emotional and social life and can compromise educational and job opportunities,

particularly in sectors where effective communication is critical, such as health care, education, local government, and justice. This research will contribute the multimedia-based speech assistive technology for dysarthric children early intervention to help them to interact with others at the early stage and ease their effort to communicate with normal people. This research is also expected to assistin other future research for designing speech assistive multimedia for young children who have speech impairment disorder.

The development of Let's Talk Now mobile app is an attempt to support the children with disabilities such as dysarthria to be able to mingle and interact with others like normal children as they too have the right to have their views, wishes and feelings taken into account when decisions are made about their lives. This research is one way to facilitate speech disabled children's involvement in daily conversation and as an early intervention to facilitate their recovery. Not only that, this research is a respect for the evolving capacities of children with disabilities, specifically the dysarthria children and it supports the Malaysia and UNESCAP (United Nations Economic and Social Commission for Asia and the Pacific) call of adapting the Incheon Strategy to " Make the Right Real" for persons with disabilities, which includes strategies for expanding early intervention of children with disabilities. By doing this research, it carries a promise for the dysarthria children's participation in community and of making contribution to build inclusive and sustainable societies in the Industrial Revolution 4.0 era.

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