Effectiveness of 'Let's Talk Now' Mobile App in Assisting Dysarthric Children to Communicate

Subashini Annamalai, AzizahChe Omar

Abstract: ***Dysarthric children suffer from a neurological disorder that damages the motor speech articulation. These children could not have an accurate and smooth communication with their family and friends as they have difficulties in speaking out the words. A mobile app named 'Let's Talk Now (LeTaNo) was designed and developed to assist the dysarthric children aged 3 to 7 years old to communicate. This app is expected to function as an early assistive technology intervention to help the dysarthric children to correspond and enable them to be understood by others.The purpose of this study is to investigate the effectiveness of the LeTaNo app in assisting the dysarthric children to communicate. This study involved 30 respondents who are related to dysarthria namely therapists, parents, and teacher of dysarthric children. The LeTaNo mobile application was then evaluated using a questionnaire named Mobile App Effectiveness Questionnaire (MAEQ). The findings described that all of the respondents agreed that the LeTaNoapp is usable and suitable in helping the communication between dysarthric children and people.It helps the dysarthric children to interact at the initial stage independently and become their 'voice' to communicate with people around them.***

Keywords: LeTaNo; Dysarthria; Children; Early intervention; Mobile App.

I. INTRODUCTION

Speech holds an important role in communication and it is the central to daily life. Speech is necessary to express thoughts, emotions and needs [1]. If the speech which is an important process that involved in the communication process is impaired, the communication will be disordered. 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 [1].

Research claims that the prevalence of speech disorders among Malaysian children is quite alarming. Research extrapolates (based

on the prevalence rate of speech disorders in the USA) that around 235,224 Malaysians could be suffering from speech disorders [2]. This makes 0.78% of the population of Malaysia which is 30,073 are children as of July 2014 [3]. Among the main disorder that affected them are dysarthria.

Dysarthria is a motor speech disorder that affecting millions of children [4]. It is a disorder that causes language alteration produced by a brain lesion [5]. A dysarthric child has much difficulty in communicating, as this disorder induces bad or no pronounced phonemes and poor articulation [6]. 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 [6].

Although, there are many types of dysarthria depending on the area of the nervous system affected, all types affect the articulation of consonants and vowel, causing of slurring of speech [7].

Over the past decades, several speech based assistive technologies and techniques such as Automatic Speech Recognition (ASR), Synthesis of Sysarthria Speech, Concatenation Algorith, Grafting Technique, TORGOMorph System, and ALADIN, have been developed for users with dysarthria based on the severity level [7]. Despite their growing presence, commercial speech recognition technologies are still not easily employed by individuals who have speech or communication disorders [8]. This speech based assistive technologies and techniques need supervision from the therapist and caregivers and little has been done to assist the children who have this communication disorder in the early stage of experimentof recovery [9]. Furthermore, these speech assistive technologies are tools that facilitate the recovery of the dysarthric patients and it does not help the children to communicate at the initial stage. It can be time consuming, especially when phono-articulatory dynamics of the assistive technology are complex. In most cases, this constant monotony and lack of opportunities for individual practice affect the children's motivation for recovery and diminish their effect to be independent. The children get frustrated as the initial attempt 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.

At the initial stage, the speech assistive aids should be implemented through a family-centered approach; the intervention will be carried out by the parents or caregivers. The speech clinicians who facilitate recovery to the use of more advanced speech assistive technologies and techniques takes on a supporting role in providing help and guidance [9]. These initial approaches entail providing a context of emotional support to the children and also promote the child's communicative developmentthroughout everyday routines [9].

This research attempts to investigate the effectiveness the LeTaNo app that will act as a multimedia-based assistive technology aid that will assist the dysrathric 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. The LeTaNo app also functions as an early intervention that will help them to engage in the other assistive technologies that can help them to recover.

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II. LITERATURE REVIEW

Speech is a dynamic process that is necessary to express thoughts, emotions and needs [1]. If this process is impaired, the communication is disordered. A communication 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 [1]. Therefore, it is important to enhance the communication quality of individuals suffering from a speech disability by offering them more possibilities to interact with their environment. This research focuses on one of the most common speech disorders associated with a neurological impairment called dysarthria.

Dysarthria is a type of motor speech disorders where normal speech is disrupted due to loss of control of the articulators that produce speech [10]. It is a set of congenital and traumatic neuromotor disorders that impair the physical production of speech [11]. 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 [12]. 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 [13]. 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 [13]. This disorder can be detected before a child is 3 years old [14]. The children who have this disorder are able to understand conversations, but they have difficulties to speak out their words.

Research on dysarthric patient have showed that a lack of tongue and lip dexterity often produces heavily slurred speech and a more diffuse and less differentiable vowel target space [15]. The lack of articulatory control often leads to various involuntary sounds caused by velopharyngeal or glottal noise, or noisy swallowing problems [16]. Dysarthric speech can be up to 17 times slower than regular speech, at about 15 words per minute in severe cases [17] and this can be laborious for the speaker and listener.

A person with dysarthria may experience any of the following symptoms [18], 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

Generally people with dysarthria have full understanding of the language and know what they want to say, but just have trouble actuallysaying it [18]. Since dysarthria cannot be cured with surgery or medication[19], it is a huge source of frustration for the individual and without treatment can be quite detrimental to confidence and selfesteemlevels. Therefore, early intervention in the form of speech and language therapy is recommended [20] and behavioral interventions involving assistive technology tools are often used to help the dysarthric patients [15].

Assistive technology refers to the devices and services that are used to increase, maintain, or improve the capabilities of a personwith a disability [21]. Consequently, speech assistive technology (SAT) addresses the need of people withcommunication disorders, and could assist a significant proportion of them to interact more with their surroundings [22]. Fortunately, advances in computer and multimedia technology have led to the creation of specialized assistive toolsthat help make it possible for individuals with no speech, or individuals with poor speech, to overcome their communication problems[23]. It is designed to support or enhance the speaking capability of a speech disabled person[22].

The SAT varies in terms of their portability, complexity, input method, vocabulary representation format, and means of output delivery [24]. Selecting an appropriate system must be tied to the needs and capabilities of the user, especially ifit involves children [25].Clearly, the SAT can be extremely powerful tools for individuals with speech and language disorders [25].

Research suggests that if a child has been detected to have speech disorder such as dysarthria, the caregivers should not wait andimmediately start with an early intervention of Speech Assistive Technology as the developmental language deficits do not disappear with age [25]. 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 [26]. Hence it is essential to intervene early because the early intervention services using simple and user friendly speech assistive technology enhance child development [27].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. Table 1 describes the types of speech assistive technologies, its characteristics, examples, advantages and disadvantages.

Table. 1 Assistive Technology for Speech Impairments

Type of Assistive Technology	Characteristics	Examples	Advantages	Disadvantages
Low-tech	Uses paper, plastic or similar materials	Simple picture/word board or cards; PECS; eye-gaze picture board; visual scheduler or planner; adapted pens/pencils	Usually low cost; portable; personal; training is quick; readily acceptable to listener; rugged; no need for power supply	Very limited speed; very limited vocabulary; unable to use for long-distance communication
Mid-tech	Uses batteries for voice, text, or light output	Lighted on/off devices; "Wrist communicator" (eg. with 2-10 stored vocal outputs); keyboard with display or printer; scanning light board (eg. with pictures)	Low-to-moderate cost; usually portable; usually personal owned; training is moderate; usually acceptable to listener; occasionally can use for limited long-distance communication	Limited speed; limited vocabulary; limited distance communication; power supply needed
High-tech	Microcircuits and microcomputer technology	Adapted laptop computers; commercially available VOCs (dynamic displays, touch pads or keyboards; individualized devices that use special inputs (eg. eye blinks)	Ease of progressing in skill levels; able to carry out extensive and efficient conversations; usually portable; often can use for long distance communication (eg. telephone); able to connect to other devices (eg. for access to computer or for environmental control)	Moderate to very high cost; sometimes is not personally owned; power supply needed; training often extensive; listeners may need to have training

Source: [25]

Multimedia based assistive technologies (MAT) are one of the types that have been developed and used widely to assist speech impairment [9]. Speech based MAT (SMAT) systems/ applications are used to establish functional communication when natural speech methods are insufficient to achieve daily communication goals and meet communication needs [23]. 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 [23]. 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) [23].

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[28]. 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 [28]. 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 [28].

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 the spoken words [30]. However, most of the existing SMAT include a speech recognition element[31] or text input. Young children who are already having difficulty in pronouncing clearly and do not know alphabets, find it impossible for these systems to assist them. Decisions about assistive technology tools should always begin with a consideration of the individual child's needs and interests, the nature of the environments in which the child learns and the tasks needing to be completed [31]. Furthermore, the existing SMAT systems/ applications are complex and modelled for adults with dysarthria [14]. These speech interventions for adults involves rehabilitating a speech system that was once intact [14],whereas treating children involves treating a developing motor control, speech sound, cognitive, and linguistic system [32]. 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 [33][34].

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 [8] 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. Pennington et al. [14] argued that for a better recovery, the children will have to be exposed to it at an early stage. However, little has been done to assist the children who have this communication disorder in the early stage of experiment of recovery [9].

III. PURPOSE OF THE RESEARCH

The existing issue is that the existing speech based assistive technologies and techniques that have been developed for users with dysarthria are complex and is not easily employed by individuals who have speech or communication disorders [8]. It is not customized for the early intervention of these children. The use of the existing assistive technologies needs supervision of the therapist and little has been done to assist the children who have this communication disorder in the early stage of experiment of recovery [9]. It also does not help the children to communicate at the initial stage. It can be time consuming, especially when the dynamics of the existing assistive technology are complex. In the initial stage, the speech assistive aids should be implemented through a family-centered approach as the intervention will be carried out by the parents or caregivers. Therefore, this research attempts to evaluate the effectiveness of a mobile application named LeTaNo that was designed and developed as an early intervention to assist the dysarthric children to communicate at home or their peers independently. 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; hearing, oral structure & function, and receptive language.

IV. LET'S TALK NOW (LETANO) APP

Let's Talk Now (LeTaNo) was designed and developed as an early intervention to help the dysarthric children who are facing the problem to communicate and enable them to be understood by others. This application will focus on daily communication phrases. It is employed with the redundancy of multimedia elements such as text, graphic, narration and animation, and the content focused on daily usable terms and conversations like family, greetings and expressions, places, ordering food and beverages, activity and asking for help. The LeTaNo mobile application is available in dual language; English and Mandarin.

LeTaNo was developed using Macromedia Flash with Action Script 3.0. The lesson content for this mobile application was developed based on the Special Children Curriculum syllabus that was provided by the Special Children Care Centre. The user interface of the MALPS is designed using the appropriate color, font and graphics. This mobile application was designed and developed by using the ADDIE Model (Analyze, Design, Develop, Implement, and Evaluate). The layout and navigational behavior of the mobile application was designed using the Interaction Design theory (IxD). It is designed to have all the important features such as text, narration, background music, graphics and animation. The mobile application was not designed with assessment (exercise) and the purpose of this application as an early intervention to help the dysarthric children to communicate and enable them to be understood by others. The app can be used in mobile or tablet mode.

Figure 1 illustrates the interfaces of the LeTaNo in English version and Figure 2 illustrates the interfaces of the LeTaNo in Mandarin.

Fig. 1 Interfaces of the LeTaNo in English version

Fig. 2 Interfaces of the LeTaNo in Mandarin version

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V. RESEARCH METHODOLOGY

This study is an attempt to investigate the effectiveness of the LeTaNo mobile application from the perspective of 30 respondents who is related to dysarthria namely therapists, parents, and teacher of the dysarthric children. The researchers did not evaluate the dysarthric children themselves as they are very shy and they do not communicate with strangers. Not only that, it is very difficult for them to express their agreement or disagreement to the questionnaire as they are still young children. Therefore, the researchers have approached the therapists, parents, teacher of the dysarthric children to contribute their opinion on the effectiveness of the app after experiencing it together with the dysarthric childrenfor ten days.

This app was downloaded to their smartphones and tablets, and are given to the children. Some of the children have normal movement and some of them are wheelchair bounded. In this case, the device is attached to the wheelchair. Prior to the intervention, the respondents are given 1 day training to use the app, and they were given 2 days to carefully train the dysarthria children on how to communicate using the LeTaNo app. After the tenth day, the researchers observed the children communicate using the app and evaluated the effectiveness of the app.

For this purpose, a questionnaire, named Mobile App Effectiveness Questionnaire (MAEQ)(Appendix 1) wasdeveloped by adapting Becker [33] structured questionnaire. This questionnaire was then validated by experts as some of the items were reconstructed. It includes 30 items that measure the 7 constructs; Task technology fit; Social influence; Ease of use; Perceived Usefulness; Trust; Self efficiency; and Intention. The Cronbach Alpha value of the items is 0.827 indicating that it is a reliable questionnaire. The MAEQ questionnaireis worded positively and negatively,which requires the respondents toindicate their response according to the rating based on a Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree).For this study, scores of negatively stated items were reversed in the data analysis as high scale indicates positive response and low scale indicate negative response.

The data collected were analyzed using parametric statistical method. Table 1 describes the constructs and its abbreviation used in the MAEQ questionnaire.

Table. 1The constructs and abbreviation used in the MAEQ questionnaire

Construct	Abbreviation
Task Technology Fit	TTF1
	TTF2
	TTF3
	TTF4
	TTF5
	TTF6
Social Influence	SI1
	SI2
	SI3
	SI4
	SI5
Ease of Use	EU1
	EU2
	EU3
	EU4
	EU5
Perceived Usefulness	PU1
	PU2
	PU3
	PU4
Trust	T1
	T2
	T3
	T4
Self-efficacy	SE1
	SE2
	SE3
	SE4
Intention	I1
	I2

Figure 3 illustrates the implementation procedure of this research.

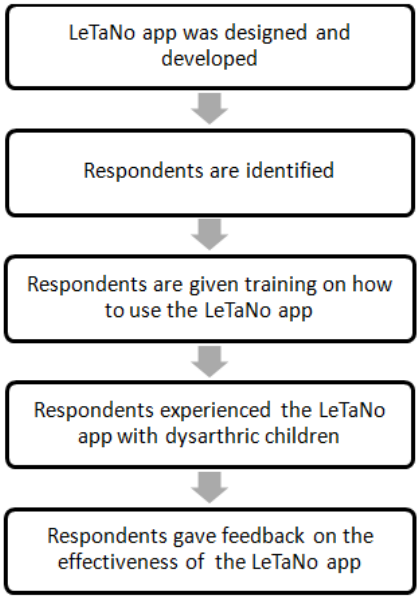

Fig. 3 Implementation procedures

VI. FINDINGS

The purpose of this study is to investigate the effectiveness of Let's Talk Now (LeTaNo) app in assisting dysarthric children to communicate. 30 respondents who are related to dysarthria namely therapists, parents, and teacher of the dysarthric children responded to the questionnaire that was developed to evaluate the effectiveness of the mobile app.

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 Respondents' demographic information

Information		Distribution	Percentage (%)
Role	Therapist	7	23.3
	Parents	15	50.0
	Teacher	8	26.7
Gender	Male	11	36.7
	Female	19	63.3
Platforms	Android/ Google	25	83.3
	iOS	0	0.0
	Microsoft	5	16.7
Device	Smartphone	8	26.7
	Tablet	22	73.3

Table 3 describes the statistical analysis of the effectiveness of the LeTaNo app from the respondents' response measured by the MAEQ questionnaire.

Table. 3 Statistical analysis of MAEQ constructs

Construct	Items	Mean	Standard Deviation	Mean of Mean
Task Technology Fit	TTF1	4.50	.572	4.411
	TTF2	4.43	.504	
	TTF3	4.47	.507	
	TTF4	4.37	.490	
	TTF5	4.30	.596	
	TTF6	4.40	.814	
Social Influence	SI1	4.27	.450	4.420
	SI2	4.60	.498	
	SI3	4.47	.571	
	SI4	4.40	.894	
	SI5	4.37	.615	
Ease of Use	EU1	4.43	.568	4.453
	EU2	4.20	.714	
	EU3	4.57	.504	
	EU4	4.70	.535	
	EU5	4.37	.669	
Perceived Usefulness	PU1	4.30	.750	4.408
	PU2	4.50	.572	
	PU3	4.37	.615	
	PU4	4.47	.507	
Trust	T1	4.50	.572	4.383
	T2	4.20	.761	
	T3	4.37	.718	
	T4	4.47	.681	
Self-efficacy	SE1	4.30	.794	4.400
	SE2	4.57	.568	
	SE3	4.30	.837	
	SE4	4.43	.626	
Intention	I1	4.13	.860	4.283
	I2	4.43	.568	

Table 3 describes that 7 construct of effectiveness were evaluated by 30 respondents. Overall, the findings show that the mean scores for all the items for all 7 constructs has been evaluated with value more than 4.00. For the task technology fit construct, all six items have scored a mean value of more than 4.00. The average of mean score for this construct is 4.411 indicating that the respondents agreed that the developed LeTaNo app suit the task intended. As for the second construct which is the social influence, the respondents had agreed on the entire five items, scoring a mean value of 4.42. This means that the respondents agree that they perceive that their social environment, such as family members, friends, and colleagues, believe the LeTaNo should be used by their children. The third construct is ease of use. There were five items for this construct. The analysis shows that for this construct, the respondents have agreed that the LeTaNo app is easy to use as the average of the mean scores shows the value 4.45. Perceived usefulness recorded a mean score of 4.40, indicating that the app is useful in assisting the dysarthric children to communicate. Respondents have also evaluated the LeTaNo app as secured and trustworthy. The mean of the mean scores for this construct is 4.38. In addition, the self-efficacy and also the intention constructs were also scored high. The average of the mean scores for self-efficacy construct is 4.40. This reveals that they feel confident to let the dysarthric children to use the 'Let's Talk Now' app on his/her own. However, some of the caregivers would still want to check the availability of other suitable mobile application for their dysarthric child to communicate. This was known when the respondents recorded a mean value of 4.28 for intention construct which has two items.

VII. DISCUSSION AND CONCLUSION

Dysarthria is a motor speech disorder and a dysarthria child has much difficulty in communicating. 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. 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 effectiveness of an early speech intervention named 'Let's Talk Now' (LeTaNo) which was designed with redundant multimedia elements for the use of dysarthric children aged 3 to 7 years old. The LeTaNo mobile application was then evaluated using a questionnaire, named Mobile App Effectiveness Questionnaire (MAEQ) was developed by adapting Becker [33] structured questionnaire. This questionnaire evaluated the effectiveness of the app in assisting the dysarthria children to communicate. This research involved 30 respondents who are related to dysarthria namely therapists, parents, and teacher of dysarthric children. The findings of the evaluation on the LeTaNo mobile application imply 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 LeTaNo app should be used by their children. They also stated that they feel confident to let the dysarthric children to use the LeTaNo app on his/her own. Overall, the respondents agreed that the Let's Talk Now (LeTaNo) 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.

Not only them, it will also benefit their caregivers; parents, teachers and the therapists. This research aims to help the dysarthric children to be able to converse and interact with others at the early stage of recovery intervention. It is an attempt to support the children with disabilities such as dysarthria to be able to mingle and interact with others like normal children. They too have the right to have their views, wishes and feelings taken into account when decisions are made about their lives, as recognized and supported by the Government policy, guidance and legislation. This research is one way to facilitate speech disabled children's involvement in daily conversation and as an early intervention to facilitate their recovery. This research will also uphold the obligations of the Department of Social Welfare under the Ministry of Women, Family and Community Development, Ministry of Health and the Ministry of Education to provide recommendations for the care and support of the children with disabilities. This will help the Malaysian government to achieve its' aspirations that have been recorded in the Government Transformation Program (GTP) 2.0 (NKRA- Education & Social well being). 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.

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APPENDIX 1

Table. 4 Mobile App Effectiveness Questionnaire (MAEQ)

Construct	Abbreviation	Measurement items
Task Technology Fit	TTF1	'Let's Talk Now' app is adequate for the use of my dysarthric child.
	TTF2	'Let's Talk Now' app is helpful in assisting my dysarthric child to communicate
	TTF3	'Let's Talk Now' app content is sufficient.
	TTF5	'Let's Talk Now' app has suitable interface for my dysarthric child.
	TTF6	'Let's Talk Now' app is has been properly designed to fit communication purposes.
	TTF7	'Let's Talk Now' app is useful to provide a 'voice' for my dysarthric child.
Social Influence	SI1	As a caregiver, I think that 'Let's Talk Now' app is useful for my dysarthric child to communicate with others.
	SI2r	As a caregiver, I think that 'Let's Talk Now' app would not useful for my dysarthric child.
	SI3	As a caregiver, I would also use the 'Let's Talk Now' app.
	SI4	I think other people would be surprised if my dysarthric child uses the 'Let's Talk Now' app to communicate.
	SI5	As a caregiver, I think that my dysarthic child will be happy to communicate with others using the 'Let's Talk Now' app.
Ease of Use	EU1	I find it easy for my dysarthric child to get the benefits from the 'Let's Talk Now' app.
	EU2r	Using the 'Let's Talk Now' app is complicated.
	EU3r	Using the 'Let's Talk Now' app is taking a lot of effort.
	EU4	As a caregiver, I find that the 'Let's Talk Now' app is easy to use.
	EU5	Learning to operate the 'Let's Talk Now' app is easy for my dysarthric child.
Perceived Usefulness	PU1	I find the 'Let's Talk Now' app to be useful in improving my dysarthric child's life in general.
	PU2	I think that the 'Let's Talk Now' app to be useful in improving my dysarthric child's communication.
	PU3	As a caregiver, using the 'Let's Talk Now' app would make me save time.
	PU4	I think that 'Let's Talk Now' app provide a very useful service.
Trust	T1	My dysarthric child feels apprehensive when he/she is using the 'Let's Talk Now' app.
	T2	As a caregiver, I think using 'Let's Talk Now' app would not divulge my dysarthric child's personal information.
	T3	As a caregiver, I feel using the 'Let's Talk Now' app is entirely within my dysarthric child control.
	T4	As a caregiver, I think that 'Let's Talk Now' app is secure to use.
Self-efficacy	SE1	As a caregiver, I feel confident when my dysarthric child uses the 'Let's Talk Now' app on his/her own.
	SE2	The 'Let's Talk Now' app does not need unnecessary skills to be operated successfully.
	SE3	As a caregiver, I feel confident when my dysarthric child uses the 'Let's Talk Now' app regularly.
	SE4	As a caregiver, I feel confident when my dysarthric child works through all interventions that the 'Let's Talk Now' app provides.
Intention	I1	As a caregiver, I intend to use the 'Let's Talk Now' app to assist my dysarthric child to communicate.
	I2	I intend to check the availability of other suitable mobile application for my dysarthric child to communicate.

Source: Becker [33]