

Can the PhonicStick enable language play and support phonological awareness for children with Down's syndrome?

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Short Abstract

The PhonicStick is a speech sound generating joystick, developed at the School of Computing, University of Dundee, in Scotland with the main aim of developing ways to enable language play for children with Complex Communication Needs (CCN). Its long term goal is the support of phonological awareness and phoneme based literacy learning. Research shows that children with Down's syndrome are at risk for reading acquisition difficulties, primarily because of their reduced phonological awareness. The present study investigates if the PhonicStick can be used to initiate interest in language play in children with Down's syndrome, in order to stimulate their reduced phonological awareness. Results show, that the PhonicStick can be used to introduce and enhance phonological awareness in children with Down's syndrome, that an increase in phonological awareness is possible even during a short time of practise with the PhonicStick and that some phonological awareness specific tasks are performed better with the PhonicStick than without. Since children with Down's syndrome also benefit from a phonological awareness based approach to literacy, practising phonological awareness skills through language play with the PhonicStick might also have a future positive effect on their literacy acquisition.

Extended Abstract

Background

Language and literacy in Down's syndrome

Down's syndrome (DS) is a congenital condition caused by extra chromosome 21 material in the cells. The most dominating symptoms of DS are cognitive impairments, with language skills being among the most impaired of cognitive qualities (Annerén et. al., 1996). Chapman and Hesketh (2000) describe the sequence of cognitive and language development as generally following that of typical development but report broad individual differences in terms of rate (IQs average 50 and range from 30 to 70) with specific, notable phenotypically characteristic domains of delay in verbal short-term memory and expressive language. Many of the linguistic skills that are impaired or whose development is delayed in DS are skills that set the stage for the acquisition of literacy skills in typically developing children (Abbeduto et. al., 2007). Previous research show that children with DS,

are at risk for reading acquisition difficulties, primarily because of their reduced phonological awareness skills (Kennedy & Flynn, 2003) and that a phonological awareness based approach to literacy can be beneficial for children with DS (Kennedy & Flynn, 2002).

Phonological awareness and language play

The term phonological awareness (PA) is usually used to describe the ability to analyze spoken words into a sequence of their constituent sounds (phonemes) (Cossu et. al., 1993). This awareness can be assessed with a great variety of PA tasks such as word or non-word differentiation and repetition, rhyme and alliteration production and detection, phoneme isolation, phoneme segmentation, sound synthesizing, phoneme counting, and phoneme substitution.

The term language play involves the practice in PA areas of language under playful circumstances, such as through games, songs and nursery rhymes. Compared to typically developed children, the conditions of the acquisition of PA through language play are different for children with Down's syndrome because of their impaired language skills and dysarthria. Black et al. (2008a) suggest that "not being able to speak has a negative effect on literacy learning: it limits the opportunity to 'play' with sound which impacts on the acquisition of coding and decoding skills; and it limits the development of novel vocabulary which in turn affects the receptive environment necessary for literary learning".

The PhonicStick

The PhonicStick is a speech sound generating joystick with the main aim to enable language play for children with Complex Communication Needs (CCN) and the long term goal of supporting phonological awareness and phoneme based literacy learning, (Black et al., 2008b).

The PhonicStick provides access to letter sounds (phonics) used in the literacy programme Jolly Phonics, a synthetic phonics based programme for literacy teaching (Lloyd, 1998). By moving the joystick in its eight different compass directions, the user can collect phonemes which the joystick then blends together, generating real words or non-words (Black et. al., 2008b). Auditory feedback for the selected phoneme is given throughout the collecting process. Compared to other existing speech generating devices, the PhonicStick is not literacy based nor does it use a visual interface – instead it provides direct access to spoken phonemes and language play (Black et. al., 2008a).

Aim

This study is based on the presumption that the PhonicStick can be used for language play and can thus also be used to stimulate PA in children with DS. By using hand movements to directly access phonemes, the PhonicStick may appeal to the visual processing ability which is often of strength to children with DS. The previously presented problems related to auditory short-term memory may also be facilitated through access to auditory feedback at any time during language play.

The main question of this study is therefore: Can the PhonicStick be used for the purpose of enabling language play for children with DS? Further research questions regard the capability of children to physically and technically manoeuvre the PhonicStick as well as how well it can be used in PA specific tasks. How well the PhonicStick can capture the interest and motivation of the participants is also of interest in the evaluation of the device.

Method

Six children with Down's syndrome between five and fifteen years of age, currently enrolled within the UK educational system, were recruited through the local speech and language therapy service. The participants were asked to take part in six sessions, two sessions of pre- and post testing of their phonological awareness skills, and four intervention sessions. During the intervention sessions, participants were asked to: remember and generate the six phonics; generate three phonic combinations of phonics; produce given target real or non-words; and complete phoneme substitution tasks using the PhonicStick. Participants were observed to see whether they showed interest when playing with phonemes. Although changes in phonological awareness were not expected within the short time frame, testing using the PIPA (Preschool and Primary Inventory of Phonological Awareness, Frederickson, Frith et al., 1997) was carried out in order to record any possible changes. This study has been analyzed using predominantly observational and exploratory methods and should be viewed as a multiple case study where results are discussed from a qualitative perspective. The study was approved by the local NHS Medical Research Ethics Committee.

Results

Of the five out of six participants who completed the study, all were able to blend phonemes into words. An increase in phonological awareness skills, such as phoneme isolation, segmentation and substitution were recorded. Some phonological awareness specific tasks are shown to be performed more easily with the PhonicStick, than without. The participants showed interest and enthusiasm during exercises with the PhonicStick.

Discussion

Results show that an increase in phonological awareness is possible even during a short time of practise with the PhonicStick. The ability of children with DS to use the PhonicStick to complete tasks associated with PA more successfully supports the use of the tool as a means of working on PA with such children. Their enjoyment when using the PhonicStick also makes it a suitable device for enabling language play. Since children with Down's syndrome benefit from a phonological awareness based approach to literacy, practising phonological awareness skills through language play with the PhonicStick might also have a future positive effect on their literacy acquisition. The features of phoneme complementary hand movements and constant auditory feedback may make the PhonicStick suitable to this particular population due to the auditory processing problems related to Down's syndrome, i.e. limitations to their phonological short-term memory system.

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