Teaching number recognition in a child with autism

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Executive summary

Number recognition can be defined as the ability to identify and name basic numerals. Number recognition encompasses a variety of separate skills such as matching, identifying, labelling and also 1:1 correspondence between numbers (in their symbolic form) to quantities and written words. This case study will highlight the barriers that a pupil encountered when learning to order the numbers 1, 2 and 3. This case study will highlight what prerequisite skills were taught and how programme changes, particularly involving the use of an augmentative and alternative communication (AAC) device, eventually aided the pupil in learning to identify the numbers 1, 2 and 3.

Introduction

This case study focuses on a male pupil in Key Stage 3 who is currently working within Level 1 (0-18 months) of the Verbal Behaviour Milestones Assessment and Placement Program (VB-MAPP). He has key strengths in his Visual Perception/ Match to Sample (VP/MTS) and Receptive skills. In order to communicate with others, this pupil currently uses both Makaton sign and an AAC in the form of the Proloquo2go application on his iPad.

One goal within this pupil's Individual Education Plan (IEP) was for him to be able to 'Order Numbers' such that if he were given the number cards, 3,1,2, he would be able to place them onto a table and they would read correctly from left to right: 1, 2, 3. When tasked with teaching the pupil to order numbers, we recognised that there were a number of barriers, namely that the pupil did not know how to find the numbers when they were in an array nor did he know what the numbers were called. This case study highlights the importance of teaching prerequisite skills and illustrates what methods could be used to teach number recognition to a child with autism.

Method

Given that visual discrimination, (being able to distinguish stimuli by sight) is an important part of developing number recognition, we conducted cold probes to see whether the pupil could first match to a sample. An array of three cards with the numbers 1, 2 and 3 were placed on the table. The pupil was handed a card with either the number 1, 2 or 3 and was asked to match it to the array. The pupil had no difficulties with this.

Next, cold probes were conducted to assess whether the pupil could receptively identify the correct number card when asked "Can you show me/ give me/ find the number 1/2/3?". The pupil could not do this.

The tutor began teaching this goal errorlessly. A flatline was observed and after ruling out the tutor's errorless teaching procedures, a number of programme changes were trialled. Firstly, prompting procedures were modified such that a visual prompt was paired whenever a verbal instruction was delivered (e.g. an index finger was pointed whenever asking for the number 1). With this, a match to receptive transfer was trialled. Here, the tutor would state "Can you match 3?" and would then give the number card 3 to the pupil who would then match it. This was then followed by "Can you find 3?" which often resulted in the pupil picking up any number card in the array. It was also noticeable that the pupil consistently identified the correct number card when a subtle positional prompt was provided by the tutor. Another programme change was therefore implemented.

This involved using an open palm presented at varying degrees to the target number card such that the pupil always picked up the correct card. Feedback would be provided "Yes that is number two" whilst pairing the visual (holding the middle and index finger up). Distractors would then be placed and the test was run providing a brief flash prompt.

Whilst the pupil started to progress with this programme change, it was recognised that prompts could not effectively be faded so a final programme change was implemented - this involved the use of the pupil's AAC device.

Results

The final programme change incorporated the AAC device/ the Proloquo2go application on the pupil's iPad. The pupil was already proficient in using his Proloquo2go to communicate and request for items, activities and locations.

Not only this, but he was also using the Proloquo2go to participate in 1:1 academic instruction such that if a tutor held up a picture card of a T-shirt and asked the pupil what it was,

the pupil was then able to go into the relevant folders on the device and press the button “T-shirt”.

Given this, the Proloquo2go was used to facilitate the pupil in his acquisition of receptive numbers.

The tutor would ask the pupil “What number is it?” whilst holding up a number card (e.g. 3). The pupil would scan the card and then navigate through his Proloquo2go app to the relevant folder of “Maths”. The pupil would then correctly press the button 3. Reinforcement was then delivered. A number of distractors would be placed wherein the pupil was expected to complete motor imitations or label common items.

The target number card would then be placed back onto the table in an array with other number cards. The tutor would then probe the pupil’s receptive identification and ask “Where is the number 3?”. The pupil would then pick up the correct number card from the array. This programme change has been effective in not only teaching the pupil to receptively identify the numbers 1, 2 and 3 but also the number 5 (see figure 1).

It is believed that when pressing the correct button in response to the instruction “What number is it?”, the pupil was effectively doing two things. Firstly, he was matching to a sample: the card being held up to the number button on the screen. Secondly, whilst matching to the sample, the pupil was simultaneously labelling/ tacting the correct number. The voice output on the Proloquo2go would state “three” whilst the pupil pressed the visual symbol of 3. Consequently, this made the stimuli more salient, so that when he was then asked to identify the number 3, he heard the vocal and remembered that “three” had been paired with the button (visual symbol of 3) when he had pressed it earlier.

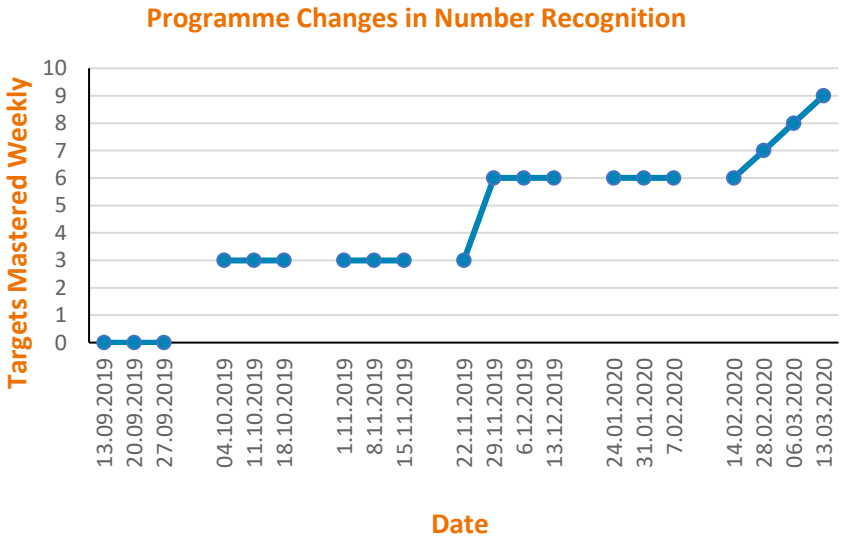

Figure 1: Programme Changes in Number Recognition Goal. A graph illustrating the progress made by a pupil learning to identify the numbers 1, 2 and 3.

Discussion

The use of technology-based interventions for individuals with autism has been used to promote responsiveness, attention, performance, social skills and peer interaction (Panyan, 1984). This case study mirrors the findings of Wehmeyer et. al (2008) who highlighted that technology can be used to also support learning academic content. Given that the pupil struggled to learn the numbers when they were presented in traditional print, it can be argued that the reinforcing qualities of a screen, the ease of the touch screen and the audio output combined with systematic teaching supported the learner in learning to identify the numbers 1, 2, 3 (and 5). While this programme change was made on an individual basis and after observing the pupil making no progress, the use of technology in this pupil’s programme will be monitored carefully, especially when going on to teach later stages of number development.

References

Panyan, M. V. (1984). Computer technology for Autistic Students. Journal of Autism and Developmental Disorders: 14: 375–382.

Wehmeyer, M. L., Palmer, S. B., Smith, S. J., Davies, D. K., & Stock, S. (2008). The efficacy of technology use by people with intellectual disability: A single-subject design meta-analysis. Journal of Special Education Technology: 23 (3): 21–30.