

# Research and Practice in Intellectual and Developmental Disabilities

ISSN: 2329-7018 (Print) 2329-7026 (Online) Journal homepage: <http://www.tandfonline.com/loi/rpid20>

## Teaching two children with autism spectrum disorder to use a speech-generating device

Jeff Sigafoos, Laura Roche, Michelle Stevens, Hannah Waddington, Amarie Carnett, Larah van der Meer, Mark F. O'Reilly, Giulio E. Lancioni, Ralf W. Schlosser & Peter B. Marschik

To cite this article: Jeff Sigafoos, Laura Roche, Michelle Stevens, Hannah Waddington, Amarie Carnett, Larah van der Meer, Mark F. O'Reilly, Giulio E. Lancioni, Ralf W. Schlosser & Peter B. Marschik (2018) Teaching two children with autism spectrum disorder to use a speech-generating device, *Research and Practice in Intellectual and Developmental Disabilities*, 5:1, 75-86, DOI: [10.1080/23297018.2018.1447391](https://doi.org/10.1080/23297018.2018.1447391)

To link to this article: <https://doi.org/10.1080/23297018.2018.1447391>



Published online: 03 May 2018.



Submit your article to this journal [↗](#)




Article views: 32



View Crossmark data [↗](#)



## Teaching two children with autism spectrum disorder to use a speech-generating device

Jeff Sigafoos<sup>a</sup>, Laura Roche<sup>a</sup>, Michelle Stevens<sup>a</sup>, Hannah Waddington<sup>a</sup>, Amarie Carnett<sup>a</sup>,  
Larah van der Meer<sup>a</sup>, Mark F. O'Reilly<sup>b</sup>, Giulio E. Lancioni<sup>c</sup>, Ralf W. Schlosser <sup>d</sup> and  
Peter B. Marschik<sup>e,f,g</sup>

<sup>a</sup>Victoria University of Wellington, Wellington, New Zealand; <sup>b</sup>University of Texas at Austin, Austin, Texas, USA; <sup>c</sup>University of Bari, Bari, Italy; <sup>d</sup>Northeastern University, Boston, Massachusetts, USA; <sup>e</sup>University Medical Center Goettingen, iDN – Interdisciplinary Developmental Neuroscience, Goettingen, Germany; <sup>f</sup>iDN – Interdisciplinary Developmental Neuroscience, Department of Phoniatrics, Medical University of Graz, Austria; <sup>g</sup>Center of Neurodevelopmental Disorders (KIND), Department of Women's and Children's Health, Karolinska Institutet, Stockholm, Sweden

### ABSTRACT

Many children with autism spectrum disorder have minimal speech and are therefore candidates for learning to use speech-generating devices. Previous research has mainly focused on teaching children to use speech-generating devices to request preferred objects. While this is an important communication function, it would seem equally important for children to learn other communication functions, such as learning to reject non-preferred objects and learning to request breaks from non-preferred activities. The purpose of the present study was to evaluate procedures for teaching two children with autism spectrum disorder to use speech-generating devices for these different communication functions. The first child was taught to request preferred foods and reject non-preferred foods. The second child was taught to request a preferred toy and request a break from learning activities. Intervention involved creating opportunities for communication and then applying time delay, graduated guidance, and contingent reinforcement procedures. With intervention, both children learned to use the speech-generating device to perform their two respective communication responses. The results suggest a promising approach for teaching multifunction use of speech-generating devices to children with autism spectrum disorder.

### ARTICLE HISTORY

Accepted 18 February 2018

### KEYWORDS

Augmentative and alternative communication; autism spectrum disorder; requesting and rejecting; speech-generating device

Approximately 30% of children with autism spectrum disorder fail to acquire speech (Tager-Flusberg & Kasari, 2013). Such children are often taught to use speech-generating devices. In a review of research in this area, van der Meer and Rispoli (2010) noted that most studies have focused on teaching participants to use speech-generating devices to request preferred objects. While learning to request preferred objects is of direct benefit to the child (Reichle, York, & Sigafoos, 1991), it is equally important for children to learn to reject non-preferred objects and request breaks from non-preferred activities (Kreibich,

Chen, & Reichle, 2015). These communication skills are functional in the sense that they enable the child to express his or her wants, needs, and preferences (Reichle et al., 1991). It would therefore seem important and necessary to develop and evaluate instructional procedures that can be successfully used to teach non-verbal children with autism spectrum disorder to use speech-generating devices for requesting preferred objects, rejecting non-preferred objects, and requesting a break from learning activities.

Along these lines, Durand (1993) taught a 5-year-old girl with cerebral palsy to use a speech-generating device to recruit attention and to request a break from a task. These two communicative functions were integrated into a single response form (e.g., “*I want to be with the group.*”). When she produced this response, the listener allowed her to leave the task and join a group where she received reinforcing attention. In another relevant study, Choi, O’Reilly, Sigafoos, and Lancioni (2010) taught three boys with developmental disabilities to complete a requesting and rejecting sequence using a speech-generating device. The children were first taught to request a missing item that was required for use in a preferred activity. On some occasions these initial requests were followed by the listener giving the child an item that did not match the prior request. That is, the child was given the wrong item. When this happened, the children were taught to reject the wrong item and then re-request the original/correct missing item.

While the findings of Durand (1993) and Choi et al. (2010) suggest promising instructional approaches for teaching multifunction speech-generating device use, communication responses do not always occur in the types of integrated sequences employed by Choi et al. (2010), nor can they always be communicated in a single response form as taught by Durand (1993). The present study aimed to determine whether systematic instruction, based on procedures used in other speech-generating device studies (Choi et al., 2010; Durand, 1993; van der Meer & Rispoli, 2010), would be effective in teaching two different communication functions that were required in different contexts, rather than as part of a single response form or integrated sequence. The different communication functions targeted for instruction in the present study were requesting preferred objects, rejecting a non-preferred object, and requesting a break from a non-preferred activity.

The present study involved two boys with autism spectrum disorder. The boys were considered ideal participants due to them both being at the beginning stages of speech-generating device intervention. Although the boys were at the beginning stages of intervention, we hypothesised that they could acquire multifunction speech-generating device use by implementing instructional procedures similar to those described in previous related studies (Choi et al., 2010; Durand, 1993; van der Meer & Rispoli, 2010). Positive results from the present study would therefore help to extend the current evidence base on the efficacy of these instructional procedures for teaching multifunction speech-generating device use to children with autism spectrum disorder.

## Method

### Participants

The participants were two boys with autism spectrum disorder. The boys were assigned pseudonyms (Liam and Jeremy) to protect their confidentiality. Liam was 9 years old. On the second edition of the Vineland Adaptive Behavior Scales (Vineland-II; Sparrow,

Cicchetti, & Balla, 2005), he obtained age equivalencies of 1:6, 1:2, and 3:11 (years: months) for expressive language, receptive language, and fine motor abilities, respectively. He had no prior experience with augmentative or alternative communication and had never used a speech-generating device prior to his participation in this study. Jeremy was 7 years old. He obtained age equivalencies of 0:8, 1:2, and 2:8 (years:months) for expressive language, receptive language, and fine motor abilities on the Vineland-II. He had no prior experience with speech-generating devices before his participation in this study. Ethical approval was obtained by the relevant university ethics committee and the boys' mothers provided written informed consent for their child to participate.

### *Setting, sessions, and personnel*

The study was conducted in a 6 × 4 m university clinic room furnished with tables and chairs and provisioned with toys, academic and leisure materials (e.g., puzzles, books, paper, colouring books, and coloured pencils/crayons), and snacks as required. The children attended the clinic for one-to-one teaching sessions once per week. Each clinic visit lasted approximately 60 min. Liam made a total of 19 weekly clinic visits over the 5-month period (April to August 2012) during which his interventions were conducted. Jeremy made 22 clinic visits over a 6-month period (May to October 2012). During each clinic visit, the children typically participated in one or two intervention sessions for each of their two respective communicative functions. Doctoral students (second and third authors) implemented the procedures and served as the primary data collectors. Additional graduate students were present during sessions to assess inter-observer agreement and procedural integrity.

### *Speech-generating device*

An Apple iPad® with Proloquo2Go® software (Sennott & Bowker, 2009) served as the speech-generating device (see Notes). Liam's iPad® was configured with two pages. Each page contained a single coloured line drawing selected from the Proloquo2Go® library. A *SNACK* symbol was placed on page 1 and a *NO THANK YOU* symbol was placed on page 2. The *SNACK* and *NO THANK YOU* symbols were used to request preferred foods and reject non-preferred foods, respectively. Tapping the symbols produced corresponding synthetic speech output; specifically, "*I would like a snack please.*" and "*No thank you.*" Jeremy's iPad® was also configured with two pages. The first page contained a *BALL* symbol and he was taught to use this symbol to request access to a ball with which he liked to play. The second page contained a *BREAK* symbol and he was taught to use this symbol to request a break from learning activities. Tapping the symbols produced corresponding synthetic speech output; specifically, "*I would like the ball please.*" and "*I would like a break please.*"

### *Identification of preferred and non-preferred stimuli*

To identify preferred and non-preferred stimuli that Liam would be taught to request and reject, respectively, we conducted a preference assessment using procedures described by DeLeon and Iwata (1996), and Pace, Ivancic, Edwards, Iwata, and Page (1985). The results

showed that Liam preferred potato chips and jelly candy and did not prefer raisins, cereal, and chocolate. He was therefore taught to request the preferred items using the *SNACK* symbol on the speech-generating device and to reject the non-preferred items using the *NO THANK YOU* symbol. A preference assessment based on Sautter, Le Blanc, and Gillett (2008) showed that Jeremy preferred playing with a plastic ball and did not prefer working on academic learning activities. He was therefore taught to request ball play and to request a break from academic learning activities.

### *Response definitions and data recording*

Three dependent variables were defined for Liam. First, a speech-generating device-based request was defined as tapping the *SNACK* symbol so as to produce the corresponding speech output. Second, a speech-generating device-based rejecting response was defined as tapping the *NO THANK YOU* symbol so as to produce the corresponding speech output within 10 s of being offered a tray containing the 3 non-preferred snacks; specifically raisins, cereal, and chocolate. Third, pushing away was defined as Liam using his hand to push away the offer of non-preferred snacks. For his baseline and post-intervention requesting sessions, we recorded the number of speech-generating device-based requests that Liam made during each 5-min session. During the requesting intervention phase, in contrast, a speech-generating device-based request was recorded only if Liam used the speech-generating device to request a snack within 10 s of being offered the tray of preferred snacks. For Liam's baseline and intervention sessions related to rejecting, we recorded whether or not a speech-generating device-based rejecting response and/or pushing away response occurred within 10 s of being offered the tray containing the 3 non-preferred foods.

Two responses were defined and recorded for Jeremy: requesting the ball and requesting a break. A request for the ball was defined as Jeremy tapping the *BALL* symbol on his iPad® so as to produce the corresponding speech output within 10 s of his toy play being interrupted. A request for a break was defined as Jeremy tapping the *BREAK* symbol on his iPad® so as to produce the corresponding speech output within 10 s of an opportunity.

### *Design and phases*

Each child received baseline and intervention phases that were sequenced in line with the requirements of modified/adapted multiple baseline across responses design (Kennedy, 2005). Initial baseline phases were needed to document that the children did not already know how to correctly use the speech-generating device. Increases in correct use of the speech-generating device during the subsequent intervention phases would therefore provide evidence that the instructional procedures were responsible for the children's improvement (Kennedy, 2005). The sequencing and structure of each child's baseline and intervention phases were individualised to accommodate their different target skills and response to intervention. When teaching Jeremy to request the ball, for example, we progressively delayed the delivery of response prompts to fade out the need for prompting and thus promote independent speech-generating device use (Ault, Gast, & Wolery, 1988; Walker, 2008). In addition, Jeremy received a final practice phase because of variable performance during the intervention phase in which he was being taught to request the ball.

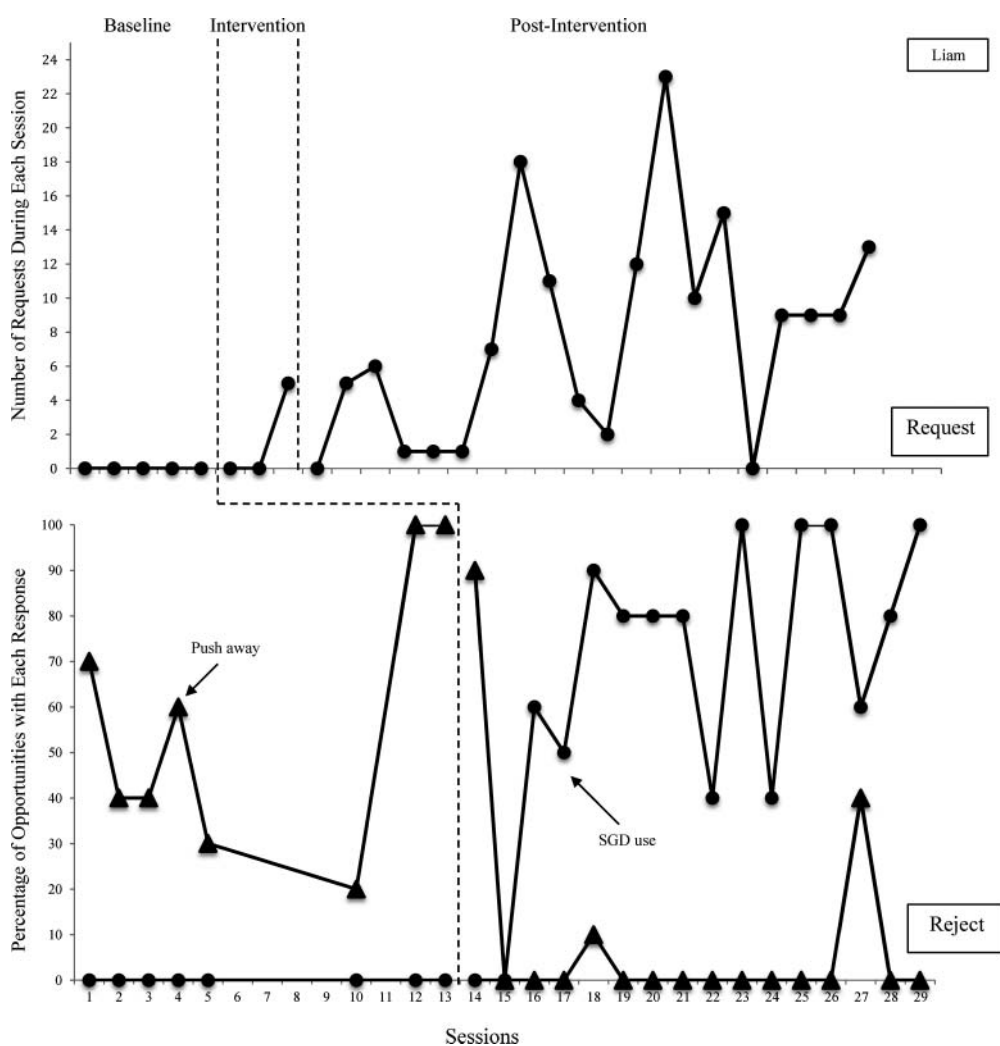
Furthermore, we incorporated a number of sub-phases in the intervention targeting Jeremy's request for a break so as to gradually increase the amount of time that Jeremy participated in academic learning activities before requesting a break.

## Procedures

**Liam: request preferred snacks.** Sessions were conducted while Liam was engaged in drawing and colouring, which he appeared to enjoy. Liam and the instructor sat at the table with the colouring and drawing materials within Liam's reach. A tray containing preferred snacks was placed on the table within Liam's view, but out of his reach. His iPad® was placed within his reach and it was turned on and opened to the screen page containing the SNACK symbol. The instructor initiated each 5-min session by briefly lifting up or pointing to the tray of preferred snacks and saying *Let me know if you want a snack*. During baseline, the instructor provided access to the tray of snacks approximately every 30 s. For each such offer, Liam was allowed to select a snack from the tray. After baseline, Liam received three intervention sessions that followed a more structured format. This change was made so that we could create structured opportunities for teaching Liam to request preferred objects and thus facilitate more rapid acquisition of this response. During each intervention session, structured requesting opportunities were created, approximately every 30 s until 10 opportunities had been provided. For each opportunity, the instructor pointed to the tray of preferred snacks and said, *Let me know if you want a snack*. After this, the instructor waited 10 s for Liam to make a request using the speech-generating device. If he did so, this response was reinforced by giving him access to the tray of snacks from which he could make a selection. If he did not make a speech-generating device-based request within 10 s, he was prompted to do so by the instructor. Prompting consisted of using the least amount of physical guidance necessary to ensure Liam activated the SNACK symbol. A request was recorded only if Liam activated the SNACK symbol within 10 s of an offer and before receiving any type of physical assistance. However, even when Liam required physical guidance, each of these prompted responses was followed by moving the tray forward and allowing Liam to select one item. The intervention phase continued until Liam responded independently, by activating the SNACK symbol without prompting, across five successive opportunities. After the intervention phase, Liam received post-intervention sessions. The procedures were identical to those of baseline, except that access to preferred snacks occurred only when Liam made a speech-generating device-based request. That is, the instructor said *Let me know if you want a snack* to signal the start of each 5-min post-intervention session. After providing this cue, the instructor simply waited for Liam to tap the SNACK symbol and activate the corresponding speech output. The instructor responded to each speech-generating device-based request by moving the tray within Liam's reach and allowing him to make a selection.

**Liam: reject non-preferred snacks.** Each session consisted of presenting 10 structured rejecting opportunities, approximately once every 30 s. Sessions were conducted while Liam had free access to the colouring/drawing materials. The speech-generating device was within reach and opened to the page with the NO THANK YOU symbol. For each rejecting opportunity, the instructor moved a tray containing the non-preferred snacks to a distance of about 20 cm in front of Liam's chest. While doing this, the instructor asked *Do you want a snack?* During baseline, if Liam pushed the tray away it was immediately

withdrawn. If he did not push the tray away or if he did not activate the *NO THANK YOU* symbol, the tray of snacks was withdrawn after 10 s. After baseline, Liam received intervention sessions. The procedures were identical to baseline, except that withdrawal of the tray was now contingent upon Liam making a speech-generating device-based rejecting response. If Liam did not independently make the speech-generating device-based rejecting response within 10 s of the tray being offered, then he was prompted to do so using the least amount of physical guidance necessary. Both prompted and unprompted speech-generating device-based rejecting responses were followed by immediate withdrawal of the tray, but only unprompted speech-generating device use is graphed in the lower panel of Figure 1.



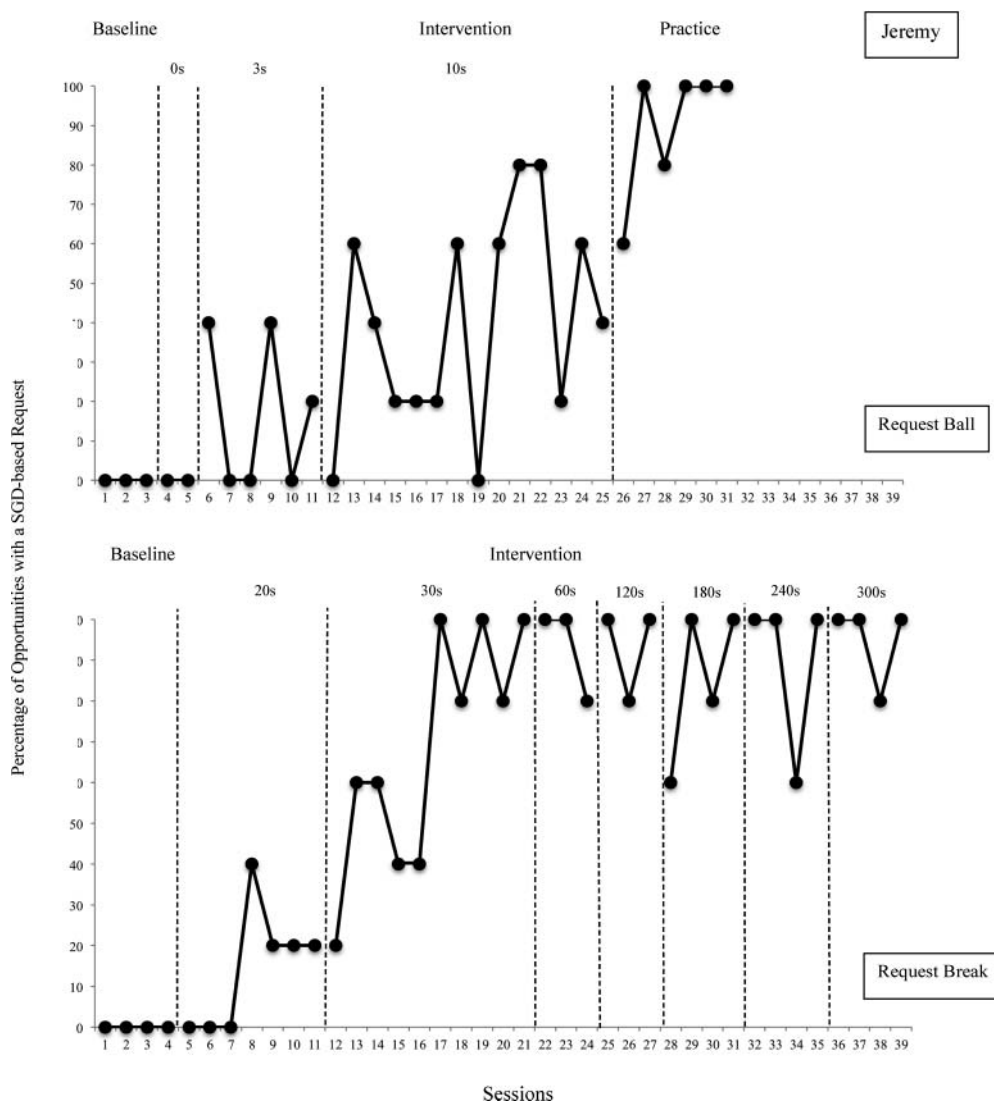
**Figure 1.** The number of speech-generating device-based requests that Liam made during each baseline, intervention, and post-intervention session (upper panel) and the percentage of opportunities with a speech-generating device-based rejecting response and pushing away response (lower panel).



**Jeremy: request ball.** Sessions lasted about 10 min and consisted of 5 structured requesting opportunities. Each session started by giving Jeremy free access to his preferred ball. He was allowed to play with the ball for approximately 1 to 2 min. After that, the instructor approached Jeremy, gently took the ball and said *My turn*. The iPad®, which was turned on and opened to the screen page containing the *BALL* symbol, was placed within reach of Jeremy immediately prior to each interruption. The instructor held the ball about 40 cm from Jeremy and looked expectantly at him for 10 s. During baseline, the ball was returned to Jeremy after 10 s regardless of whether or not he had made a speech-generating device-based request and the next opportunity was implemented about 1 to 2 min later. After baseline, Jeremy received intervention sessions, which were identical to baseline except that Jeremy was prompted to request the ball if he did not do so independently during the interruption period. The amount of time that the instructor waited before prompting was initially set at 0 s. That is, Jeremy was prompted to request the ball immediately after the instructor removed it and said *My turn*. The delay interval was then increased to 3 s and finally to 10 s (to match baseline conditions) in line with the progressive time delay procedure (Ault et al., 1988; Walker, 2008). Prompting consisted of using the least amount of physical guidance necessary to ensure Jeremy tapped the *BALL* symbol and produced the corresponding speech output. After a request occurred, whether prompted or unprompted, Jeremy was given the ball and allowed to play with it for 1 to 2 min before the next interruption was implemented. However, only unprompted requests are graphed in the upper panel of Figure 2. A final practice phase was implemented because during intervention Jeremy's requesting responses often failed to activate the speech output. This problem was due to him tapping at the edges of the iPad® screen or pressing, rather than lightly tapping, the *BALL* symbol. In an effort to correct these "errors", we physically assisted Jeremy to lightly tap the centre of the *BALL* symbol five to six times prior to each practice session.

**Jeremy: request break.** Jeremy was seated at the table and the instructor sat next to him. A variety of materials were placed in front of him (e.g., pens and paper for drawing, colouring book, crayons, and jigsaw puzzles). The iPad® was placed within Jeremy's reach. It was turned on and opened to the page containing the *BREAK* symbol. The instructor gave a verbal instruction, such as *Let's do the puzzle*, and then used physical guidance and verbal feedback (e.g., *That's right, that piece goes there.*) to assist Jeremy in using the materials. After this, the instructor said *Let me know if you want a break*. If Jeremy remained at the table, he continued to receive verbal instruction, physical prompting, and verbal feedback approximately every 10 s. He was allowed to take a break from the task for approximately 60 s if he left the table during a baseline session. All baseline sessions consisted of five such teaching interactions. After baseline, Jeremy received intervention sessions that required him to participate for increasing periods of time in the teaching interaction before requesting a break. This initial time interval was set at 20 s because during baseline Jeremy averaged 33 s at the table before he left his chair (range 3 to 95 s). This time requirement was then increased to 30, 60, 120, 180, 240, and finally 300 s as the intervention phase progressed. During intervention sessions, the instructor used verbal instruction, physical prompting, and verbal feedback approximately every 10 s to encourage task engagement. The instructor also prompted Jeremy to return to the table if he got up from his chair before the required amount of time had lapsed. After the required amount of time had lapsed, the instructor moved the iPad® within his reach and said *Let me know if you want a break*. The instructor then waited 10 s for Jeremy to request a break using the





**Figure 2.** The percentage of opportunities during which Jeremy made a correct speech-generating device-based request for a ball (upper panel) and for a break (lower panel).

speech-generating device. If a request did not occur within 10 s, the instructor used the least amount of physical guidance necessary to prompt a request for a break. Once a request had occurred, whether prompted or not, Jeremy was allowed to take a break from the task for approximately 60 s. After taking his break, he was returned to the table for the next teaching interaction until five such interactions had occurred.

### *Inter-observer agreement and procedural integrity checks*

To assess the accuracy of data collection by the instructor, a second observer independently collected data on the children's responses and compared that data to those collected by the

instructor. For Liam, these inter-observer agreement checks occurred on 15 of his 28 Request sessions and on 16 of his 29 Reject sessions. For Jeremy, inter-observer agreement was assessed on 20 of his 31 Request Ball sessions and on 22 of his 39 Request Break sessions. The resulting percentages of agreement ranged from 80 to 100 with means of 98 for Liam and 95 for Jeremy. The second observer also recorded whether or not the instructor implemented the procedures correctly. The observer had a checklist listing the procedural steps and noted whether steps were implemented as specified on the checklist. These procedural integrity checks occurred during the same sessions that were checked for inter-observer agreement. The results indicated 80–100% correct implementation.

### *Data analysis*

For Liam, we graphed the number of speech-generating device-based requests for preferred snacks that he made during each baseline, intervention, and post-intervention session. To analyse his learning of the speech-generating device-based rejecting response, we graphed the percentage of opportunities with a speech-generating device-based rejecting response and pushing away response during baseline and intervention sessions. For Jeremy, we graphed the percentage of opportunities during which Jeremy made a correct speech-generating device-based request for a ball and for a break during each of his respective sessions. For each phase of the study, we calculated the range and mean number/percentage to enable a comparison of each child's performance across phases.

## **Results**

### *Liam*

The upper panel of [Figure 1](#) shows the number of speech-generating device-based requests that Liam made during each baseline, intervention, and post-intervention session. During the 5-min baseline sessions, Liam never used the speech-generating device. During the intervention sessions, Liam received a total of 30 structured opportunities to make a request (i.e., 10 opportunities per session x 3 sessions). He reached the acquisition criterion of five successive requests in the third intervention session. In the 5-min post-intervention sessions, Liam averaged 7.8 speech-generating device-based requests per session (range = 0 to 23 responses per session).

The lower panel of [Figure 1](#) shows the percentage of opportunities with a speech-generating device-based rejecting response and the pushing away response. Liam never used the speech-generating device to reject the offer of non-preferred snacks in baseline. Instead, he pushed away offered items during 20–100% of the opportunities per session (mean = 57.5%). When the rejecting intervention was implemented, the percentage of opportunities with a speech-generating device-based rejecting response increased to a mean of 66.25% (range = 0–100%) and pushing away decreased to a mean of 8.75% (range = 0–90%).

### *Jeremy*

As shown in [Figure 2](#), during the baseline phases, Jeremy never used the speech-generating device to request the ball (upper panel) or request a break (lower panel). During the

intervention phases, Jeremy showed increases in the percentage of opportunities per session during which he used the speech-generating device to request the ball and request a break. Requesting the ball increased to a mean of 40% (range 0–80%) during the final sessions of the intervention phase. In the subsequent practice phase, speech-generating device-based requests for the ball increased to 100%. During intervention on requesting a break, correct responses increased from 80% to 100% and time on-task increased from 20 to 300 s.

## Discussion

The two participants in this study learned to use a speech-generating device to accomplish two communication functions. Liam learned to use the speech-generating device to request preferred foods and to reject non-preferred foods. Jeremy learned to use the speech-generating device to request a preferred toy and to request a break from learning activities. The learning gains made by the children could be seen as enabling them to accomplish important communicative functions related to expressing wants, needs, and preferences (Reichle et al., 1991) which are of direct benefit to the child. They are also among the first to emerge in typically developing children and might therefore be seen as foundational communication skills (Brady, 2010).

Depending on the nature of their preferences, many children with autism spectrum disorder will likely need to learn different communication response forms for different functions. For example, they might benefit from learning to use certain response forms to make requests and other response forms to indicate rejecting functions or to indicate a desire to take a break from tasks. The positive results of this study could be seen as offering a possible instructional approach for teaching multifunction speech-generating device use to children with autism spectrum disorder who are minimally verbal (Tager-Flusberg & Kasari, 2013). The approach used in this study might be considered in situations where a single communication response form would not cover multiple functions (cf. Durand, 1993). This approach might also be useful when the different communication functions are needed in different contexts, rather than as part of an integrated communicative sequence (cf. Choi et al., 2010).

The positive results are likely related to the use of well-established instructional procedures, which have been successfully applied in other studies on teaching speech-generating device use to children with autism spectrum disorder (van der Meer & Rispoli, 2010). Acquisition might also have been facilitated by the fact that both children were only ever presented with a single symbol. Making only one symbol available at a time was intended to create an errorless learning situation, which we thought was appropriate given that this was both children's initial exposure to an augmentative or alternative communication intervention and to the iPad®-based speech-generating device with the Proloquo2Go® application (Sennott & Bowker, 2009).

The results should be interpreted with caution due to the small number of participants. Another limitation is that the children did not have to discriminate among symbols due to the errorless learning approach that we adopted, as mentioned above. To address these limitations, future research is needed to assess the extent to which these procedures would be successful with other children. Future research should also evaluate whether children with autism spectrum disorder can be taught to discriminate among symbols at the same

time as learning to use those symbols for different communicative functions (e.g., requesting preferred objects and rejecting non-preferred objects).

In conclusion, the increases in correct/independent responding that occurred with intervention suggest that the intervention procedures were effective in teaching functional speech-generating device use to these two participants. These results suggest a potentially effective approach for teaching multifunction speech-generating device use to non-verbal children with autism spectrum disorder.

## Notes

<sup>1</sup>Apple iPad® is a registered trademark of the Apple Corporation, Cupertino California, [www.apple.com](http://www.apple.com)

<sup>2</sup>Proloquo2Go® is a registered trademark of AssistiveWare B.V., Amsterdam the Netherlands, [www.assistiveware.com](http://www.assistiveware.com)

## Acknowledgements

The study was supported by a grant from the New Zealand Government through the Marsden Fund Council, administered by the Royal Society of New Zealand (Marsden Fund Contract: VUW1013). We acknowledge and appreciate the contributions made by the children, their families, and school staff who participated in this study. Laura Roche is now affiliated with the Lojic Institute of Community Services, Brisbane, Australia. Michelle Stevens is now at Explore Specialist Advice, HealthCare of New Zealand, Wellington, New Zealand. Amarie Carnett is now at the Department of Educational Psychology, the University of North Texas, Denton, TX, USA.


## Disclosure statement

The authors report no conflicts of interests and are solely responsible for the content and writing of this article.

## Funding

Marsden Fund, Royal Society of New Zealand [grant number Marsden Fund Contract: VUW1013]

## ORCID

Ralf W. Schlosser  <http://orcid.org/0000-0002-2069-3911>

## References

- Ault, M. J., Gast, D. L., & Wolery, M. (1988). Comparison of progressive and constant time-delay procedures in teaching community-sign word reading. *American Journal on Mental Retardation*, 93, 44–56.
- Brady, N. (2010). Teaching requesting and rejecting sequences: An important step in early communication programming. *Evidence-based Communication Assessment and Intervention*, 4, 145–147. doi:10.1080/17489539.2010.529366
- Choi, H., O'Reilly, M., Sigafos, J., & Lancioni, G. (2010). Teaching requesting and rejecting sequences to four children with developmental disabilities using augmentative and alternative

- communication. *Research in Developmental Disabilities*, 31, 560–567. doi:10.1016/j.ridd.2009.12.006
- DeLeon, I., & Iwata, B. A. (1996). Evaluation of a multiple-stimulus presentation format for assessing reinforcer preferences. *Journal of Applied Behavior Analysis*, 29, 519–533. doi:10.1901/jaba.1996.29-519
- Durand, V. M. (1993). Functional communication training using assistive devices: Effects on challenging behavior and affect. *Augmentative and Alternative Communication*, 9, 168–176. doi:10.1080/07434619312331276571
- Kennedy, C. (2005). *Single-case designs for educational research*. Boston: Pearson.
- Kreibich, S. R., Chen, M., & Reichle, J. (2015). Teaching a child with autism to request breaks while concurrently increasing task engagement. *Language Speech and Hearing Services in Schools*, 46, 256–265. doi:10.1044/2015\_LSHSS-14-0081
- Pace, G., Ivancic, M., Edwards, G., Iwata, B. A., & Page, T. (1985). Assessment of stimulus preference and reinforcer value with profoundly retarded individuals. *Journal of Applied Behavior Analysis*, 18, 249–255. doi:10.1901/jaba.1985.18-249
- Reichle, J., York, J., & Sigafoos, J. (1991). *Implementing augmentative and alternative communication: Strategies for learners with severe disabilities*. Baltimore: Paul H. Brookes Publishing Co.
- Sautter, R. A., Le Blanc, L., & Gillett, J. N. (2008). Using free operant preference assessments to select toys for free play between children with autism and siblings. *Research in Autism Spectrum Disorders*, 2, 17–27. doi:10.1016/j.rasd.2007.02.001
- Sennott, S., & Bowker, A. (2009). Autism, AAC, and Proloquo2Go. *Perspectives on Augmentative and Alternative Communication*, 18, 137–145. doi:10.1044/aac18.4.137
- Sparrow, S., Cicchetti, D., & Balla, D. (2005). *Vineland-II Adaptive Behavior Scales* (2<sup>nd</sup> ed). Minneapolis: Pearson.
- Tager-Flusberg, H., & Kasari, C. (2013). Minimally verbal school-aged children with autism spectrum disorder: The neglected end of the spectrum. *Autism Research*, 6, 68–78. doi:10.1002/aur.1329
- van der Meer, L., & Rispoli, M. (2010). Communication interventions involving speech-generating devices for children with autism: A review of the literature. *Developmental Neurorehabilitation*, 13, 294–306. doi:10.3109/17518421003671494
- Walker, G. (2008). Constant and progressive time delay procedures for teaching children with autism: A literature review. *Journal of Autism and Developmental Disorders*, 38, 261–275. doi:10.1007/s10803-007-0390-4