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THE COMPARATIVE EFFECTS OF MODIFIED AUGMENTATIVE AND
ALTERNATIVE COMMUNICATION MODALITIES ON REQUESTING FOR A
CHILD WITH AUTISM AND VISUAL IMPAIRMENTS

by

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Abstract

The present study used a multiple probe across behaviors design, with an embedded alternating treatments design to compare the effects of two modified communication systems, the Picture Exchange Communication System (PECS) and a speech generating device, on requesting for a child with multiple disabilities, including autism and visual impairments. Both modalities were taught across the first three phases of PECS instruction (simple request, distance and persistence, and discrimination). During baseline the participant demonstrated little to no requesting across all three phases for either modality. During intervention requesting increased to proficient levels across all three phases for both modalities. Modified PECS, however, yielded noticeably faster results in the distance and persistence phase. Social validity and preference for each modality were also assessed. Both communication systems were found to be acceptable. Both the parent and participant showed preference for the modified PECS. The importance of social validity and modality preference is discussed.

Keywords

Autism; Visual Impairments; Augmentative and Alternative Communication; Picture Exchange Communication System; Speech Generating Devices; Teaching Requesting Skills; Manding

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Autism spectrum disorder (ASD) is a neurodevelopmental disability that may impair an individual's ability to behave socially with others and causes difficulty in learning social, emotional, and communication skills (American Psychiatric Association, 2013). Approximately 60% of children with ASD have a co-occurring condition, and 26% have two or more co-occurring conditions (Levy et al., 2010). Common co-occurring conditions include medical (Down syndrome, fragile X syndrome), psychiatric (anxiety disorder, depression, schizophrenia), developmental (language disorder, attention deficit hyperactivity disorder, learning disability) and neurological conditions (epilepsy, vision or hearing loss). The most common co-occurring condition is a language disorder which affects approximately 63% of children with ASD (Levy et al., 2010). Considering the social and communication deficits that many individuals with ASD experience, co-occurring conditions such as a language disorder can make learning more challenging for the individual and can make teaching communication skills more difficult.

Although less prevalent than many other co-occurring conditions, visual impairments (VI) can also be present and may impact an individual's ability to learn. Individuals with ASD are more likely to have a VI compared to those without an autism diagnosis (Kancherla et al., 2013; Levy et al., 2010; Wagner & Blackorby, 2002). An individual affected by both ASD and VI is more likely to exhibit profoundly impaired abilities including severely delayed or entirely absent language and communication skills, especially if the individual has a co-occurring intellectual disability or language disorder (Butchart et al., 2017; Li, 2009; de Verdier et al., 2020; Wrzesińska et al., 2016). Although various communication systems exist for individuals with communication deficits related to ASD, modifications to these systems may be required if the individual has a co-occurring visual impairment.

Various forms of augmentative and alternative communication (AAC) have been used to successfully teach requesting skills to individuals with multiple disabilities such as ASD, VI, and severe language delays. Locke and Mirenda (1988) successfully taught an 11-year-old boy with severe mental retardation, blindness, and a speech/language disorder to request food by touching and pressing a modified keyboard with added tactile symbols and which produced sound when pressed. The authors suggested the auditory feedback may have functioned as an aid in the participant's learning. Kee et al. (2012) taught a 28-year-old man with profound ASD and blindness to request food and drink using American Sign Language (ASL). Schaefer Whitby et al. (2019) implemented an object exchange program to teach a 7-year-old girl with ASD and VI to make requests for a variety of preferred items. Additionally, recent literature has examined how the Picture Exchange Communication System (PECS) can be adapted for teaching individuals with ASD and VI to successfully communicate requests by adhering tactile stimuli to cards (Ali et al., 2011; Ivy et al., 2014; Lund & Troha, 2008).

Several studies have also compared the effects of these various AAC modalities on requesting with individuals with ASD and other developmental disabilities. These comparisons include a comparisons of manual signs, picture exchange (PE), and speech generating device (SGD; Couper et al., 2014; van der Meer et al., 2013), PE versus SGD (Lorah et al., 2013; Sigafoos et al., 2009), the comparison of tangible symbols, PE, and direct selection (Roche et al. 2014), and PECS versus SGD (Agius & Vance, 2016; Boesch et al., 2013). The results of these studies suggest that in general AAC modalities are equally effective in teaching requesting skills to this population. Given these generally equivalent results, selection of AAC modality may need to be based on factors other than efficacy alone. Critical factors in AAC modality selection for an

individual with ASD and VI may also include variables such as social validity and consumer preference.

Social validity may be assessed at three levels including the social significance of the goals, the social acceptability of the procedures, and the social importance of the effects (Wolf, 1978). Given different AAC modalities are generally equally effective in developing communication skills, the social validity of each of the treatments' procedures is of critical importance and should be determined by the participants and their caregivers (Miltenberger, 1990; Wolf, 1978). High levels of procedural social validity generally result in greater treatment effectiveness (Miltenberger, 1990) and may increase adherence and maintenance of a program (Agius & Vance, 2016; Boesch et al., 2013). Programs whose procedures are not socially valid may not be utilized (Agius & Vance, 2016; Boesch et al., 2013; Miltenberger, 1990; Wolf, 1978).

In addition to social validity, it may also be important to assess consumer preference between AAC modalities. Although social validity may be assessed on only one intervention, a determination of preference requires at least two options to select from. When selecting an AAC modality it may therefore be important to simultaneously initially provide instruction on at least two different modalities. Concurrently providing instruction with multiple AAC modalities therefore enables a comparison of modality effectiveness, a determination of social validity, and identification of consumer preference between modalities (Sigafos et al., 2005). This may promote adoption of the most beneficial AAC modality on which to provide further instruction.

The purpose of this study was to (a) expand the literature of treatment options for individuals with severe language delays, ASD, and VI (b) determine if a SGD can be modified and used to effectively teach multiple requesting skills to an individual with ASD and VI, (c)

compare the effects of modified PECS and modified SGD on the learning and acquisition of multiple requesting skills, including making a simple request with one option, when the listener is not immediately in reach, and being able to discriminate between icons when making a request, with a child with ASD and VI, and (d) assess both the social validity of both methods and consumer preference between modalities.

Methods

Participant and Setting

Nancy, age 8, was diagnosed with multiple disabilities including Down syndrome, ASD, an intellectual disability, a seizure disorder, and VI (myopia-nearsightedness and overpowering of one eye, nystagmus in both eyes, and reduced visual acuity). Nancy could see lights and colors; however, due to her visual impairment Nancy could not discriminate between two objects or pictures of similar shape and color. Also due to the nystagmus (continuous fluttering movement of both of her eyes) visual tracking and focusing on items was very difficult and at times impossible for Nancy. At the time of the study Nancy was considered non-verbal and did not have an effective or reliable form of communication. Many attempts had been previously and unsuccessfully made to teach Nancy communication in a variety of ways including signaling “more” using a modified version of sign language (clapping hands together), using a BIGMack button, Dynavox SGD, and PECS. At the time of the study Nancy primarily communicated by grabbing the communicative partner’s hands, hitting tables and other flat surfaces, patting her chest for “my turn”, and simply reaching and taking what she wanted from others. Nancy could signal when she did not want something by pushing it away or occasionally throwing the item. Though Nancy was previously taught a few signs, these were modified due to Nancy’s fine

motor skill deficits. Nancy struggled with many fine motor behaviors and for this reason the authors chose to omit sign language as a viable modality for the present study.

Nancy's receptive language skills included following simple, one-step instructions and responding to her name. Nancy could also make a choice when presented with two objects and asked to select one. At the beginning of the study, Nancy received special education services at her local elementary school five days a week. Three days per week she would leave school early to receive applied behavior analysis therapy sessions with the first author. Nancy also attended speech and occupational therapy sessions once per week.

The study was conducted in Nancy's family home. Sessions occurred 2 to 4 times a week. There was a pause in sessions for approximately two months due to COVID-19, after which sessions resumed. Preference assessments, baseline sessions, and intervention sessions were conducted in the Nancy's kitchen, where a children's folding table and two small chairs were placed. Nancy sat on one side of the table near the wall, while the instructor sat on a side of the table perpendicular to Nancy.

Materials

Materials included textured picture cards, a 7 Level Communication Builder SGD with one or two textured picture frames, and the preferred items (food items and toys). The textured picture cards used during the PECS condition consisted of a laminated 4x4 inch square card that featured an adhered texture, a picture, and the word labeling the item the card represented. The texture was fixed at the top of the card above the picture icon. Each card also included Velcro so it could be affixed to the table. The 7 Level Communication Builder SGD allows for the participant to lightly press a picture to produce a pre-recorded message. The 7 Level Communication Builder (hereafter SGD) also allows for arrays of 1, 2, 4, 8, and 16 frames at a

time and seven different pre-recorded layouts per array option. For the purpose of the study the interventionists chose the 1-frame option for the first two intervention conditions and the 2-frame option for the third intervention condition. Textures were fixed to the lower half of the frame, which was closer to the participant. The frame also included a picture and word labeling the corresponding item. A variety of textures were used during the study and included sandpaper, shapes drawn with hot glue, soft and scratchy Velcro, and a make-up sponge applicator. Various textures were used to allow for the participant to discriminate when making a selection between two options.

Design

The present study used a single-subject multiple probe across behaviors design (Horner & Baer, 1978), with an embedded alternating treatments design (Barlow & Hayes, 1979) to compare the acquisition rates and efficiency of textured PECS and textured SGD on requesting. Baseline data were taken across a minimum of four sessions and staggered across teaching phases to show experimental control. During Phase 2 and Phase 3, baseline data were probed approximately every 6 sessions. As suggested by Horner and Baer (1978), true baseline data were collected prior to the introduction of the independent variable for all intervention conditions. Once it was established that baseline data were stable, treatment for Phase 1 began. Treatment for subsequent phases began once one or both treatments met mastery criteria in a given phase.

Response Definitions and Data Collection

In general, the dependent variable was identified as the participant's independent request for a preferred item. The topographies of the requesting behavior varied depending on the phase and condition. In Phase 1, a correct response in the PECS condition was scored if the participant

felt the textured card, grabbed it, reached across to the communicative partner (CP), and released the card in the CP's hand. A correct response in the SGD condition was scored when the participant felt and pressed the textured picture frame. In Phase 2, a correct response in the PECS condition was scored when the participant felt the textured card, grabbed the card, stood up (if sitting), took a step toward the CP, reached out and released the card into the CP's hand. A correct response was scored for the SGD condition when the participant stood up (if seated), picked up and carried the SGD to the CP, felt the texture and pressed textured frame. In Phase 3, a correct response in the PECS condition was scored when the participant felt both cards, made a selection by grabbing the preferred card, reached, and handed the card to the CP. A correct response was scored in the SGD condition when the participant felt both textured frames, and made a selection by gently pressing the preferred frame.

The lead author collected data for all conditions and phases. Data were recorded as correct responses (+) or incorrect (-). A correct response included all parts of the target behaviors occurring within 10 seconds of the CP's cue "What do you want?" Incorrect responding included prompted responses, incomplete responses, and no response. Each session consisted of 10 trials and data were recorded on a trial-by-trial basis until mastery criteria were met for each phase. Mastery criteria for each phase were 80% or more correct responding for three consecutive sessions. The accuracy percentage was calculated by dividing the total number of correct responses by the number of trials and then multiplying the result by 100.

Treatment Fidelity

A checklist listing all procedural steps was created for each condition. The presence or absence of the procedural steps was recorded on a trial-by-trial basis. Treatment fidelity data was collected by the participant's parent for 83% of Phase 1 sessions, 91% of Phase 2 sessions, and

90% of Phase 3 sessions. A percentage for treatment fidelity was determined by dividing the number of implemented steps by the total number of procedural steps and then multiplying the result by 100.

Procedures

The study was conducted in seven parts and each phase contained both baseline and treatment conditions. The seven parts included stimulus preference assessments, Phase 1: making a simple request, Phase 2: distance and persistence, Phase 3: discrimination, social validity assessments, modality preference assessments, and follow-up assessments. The first author conducted the preferences assessments and played the role of the Communicative Partner (CP) for all baseline and treatment conditions in Phases 1 and 3, and the role of the prompter in Phase 2. Nancy's parent played the role of the CP during Phase 2. The parent also completed surveys related to social validity and both the parent and Nancy engaged in several preference assessments.

Stimulus Preference Assessments

Prior to baseline, a two-part preference assessment was conducted. First, Nancy's parent was asked to complete the Reinforcer Assessment for Individuals with Severe Disability (RAISD; Fisher et al., 1996) structured interview with the first author. The RAISD identified twelve items, including toys and foods, which were then presented to the participant in a paired stimulus preference assessment format (Fisher et al., 1992). The top six items were selected for the study.

A paired-stimulus preference assessment was also conducted to select acceptable textures to adhere to the PECS cards and the SGD frames. Materials were mounted to laminated cards and presented in pairs. The participant was prompted to feel each option and asked to "pick one".

To avoid extreme texture preferences that might influence requesting, the most and least preferred textures were excluded from the study. Other textures were excluded if inappropriate and potentially dangerous behaviors occurred when they were selected, such as attempting to eat or throwing the texture card. Finally, any materials that resulted in an immediate recoil of the participant's hand as a response to touching the material were excluded from the study. The seven materials that scored in the middle range of the assessment were chosen for the study (six for the preferred items and one for the neutral stimulus used in the discrimination phase).

Phase 1

Baseline. During all baseline conditions, both communication modalities were presented in random order and counterbalanced in order to avoid carryover or sequence effects. At the beginning of each baseline session, the participant was given an opportunity to engage with a preferred item to establish motivation for the item. Following this pre-session exposure, the item was removed and the CP enticed the participant by engaging with the preferred item, indicating that the item was available, and asked, "What do you want?" Although traditional PECS protocol (Frost and Bondy, 2002) generally omits verbal cues, due to the participant's visual impairment the verbal prompt informed the participant that item was available for request. The CP offered no other cues or prompts and waited for the participant to use the communication modality associated with each condition to make a request. The preferred items were given to the participant between baseline sessions to avoid causing frustration.

During the textured PECS baseline the participant sat at the table within arms-length distance from the CP and each session consisted of 10 trials. A textured PECS card was attached to a Velcro strip on the table in front of the participant. The CP enticed the participant and asked, "What do you want?" If the Nancy reached for the item without using the textured PECS card,

the CP blocked the response and recorded the trial as an error. If the participant did not complete the target response, engaged in inappropriate behaviors, or there was no response within 10 seconds, the trial was recorded as an error. No prompting occurred and the preferred item was not delivered. If the participant emitted the target response, the item was immediately named and delivered and the trial was recorded as a success. The textured SGD baseline was the same as the textured PECS baseline except the SGD with one textured frame was presented on the table in front of the participant instead of the card.

Treatment. The PECS treatment condition was similar to the baseline condition. The distance from the CP and number of trials were the same. The item selected for the PECS condition in Phase 1 was a cup of flavored applesauce. The participant was allowed to sample the applesauce before each session to establish motivation. The textured PECS card was placed on the Velcro strip on the table in front of the participant. The CP would entice the participant, indicate the applesauce was available and ask, “What do you want?” Enticement included talking about the applesauce, allowing the participant to smell the applesauce, and tapping the cup on the table. If the participant engaged in the target behavior within 10 seconds of the cue “what do you want?” the CP immediately named the item, delivered a spoonful of applesauce, and recorded the trial as correct. If the participant did not respond, engaged in inappropriate behaviors with the card (e.g., throwing, hitting, and biting the cards), or did not complete all four steps of the target response within 10 seconds, the CP reset the card, repeated the question, and prompted the participant to complete the target response. Prompted target responses resulted in applesauce delivery, but the trial was recorded as incorrect. Physical prompting was faded systematically using a most-to-least fading procedure.

The textured SGD treatment condition was the same as the textured PECS treatment condition except the SGD with one textured frame was placed on the table in front of the participant. The item selected for the SGD Treatment 1 condition was a peanut butter and jelly sandwich (PB & J) and the participant was allowed to sample the PB & J before each session to establish motivation. If the participant emitted the target response independently, the SGD would produce an auditory label of the item and the CP delivered a bite of PB & J and recorded the trial as correct. If there was no response or if the participant did not emit the target response within 10 seconds, or engaged in inappropriate behavior (e.g., mouthing, hitting, and swiping the SGD), the CP restated the question, prompted the participant through the target response, delivered a bite of PB & J, and recorded the trial as incorrect. The same prompting procedures used in the PECS condition were used in the SGD condition.

Phase 2

Baseline. The goal of Phase 2 was to determine if the participant would complete a request if the CP was not directly next to her. The second baseline phase was similar to the Phase 1 baseline with two main differences. First, the CP was two arm-lengths away, which required the participant to get up from her chair and take a step away from the table to make the request. Second, in the SGD condition, the participant was expected to hand the SGD to the CP for her to hold while the participant made her selection. Trials were scored the same as the in Phase 2.

Treatment. The item selected for the PECS Phase 2 treatment condition was the participant's tablet, which played children's music videos. The item selected for the SGD Phase 2 condition was a Musical Rhymes Book toy, which played songs and displayed colorful lights. Procedures and response scoring were the same as in Phase 1 other than adding the distance

component. It is also important to note that the CP would accept the SGD from the participant to hold, allowing her to make a selection more easily.

Phase 3

Baseline. Prior to baseline, a short paired-stimulus preference assessment was conducted to confirm the initial paired-stimulus preference assessment results. The final baseline phase was similar to the previous baselines with the exception of providing two choices (preferred and non-preferred items). In the PECS condition, the participant was presented with two textured cards. In the SGD condition, the participant was presented with two textured frames on the SGD. The trial was recorded as correct if the target response occurred and the preferred items were requested. The trial was recorded incorrect if the non-preferred item was selected or if the target response did not occur.

Treatment. The goal of the final phase was to teach the participant to discriminate between a preferred item and a non-preferred item. Therefore, the CP remained at the table, one arm-length away from the participant. A different preferred item was used for each condition, but the same neutral stimulus (a Post-it Note) was used in both conditions. Prior to each treatment condition, a short paired-stimulus preference assessment was conducted between the preferred item and the neutral item. The positions of the preferred and non-preferred icons were alternated at random, but always located side-by-side at the same distance in front of the participant. The same prompting procedures from previous phases were used for both treatment conditions.

The preferred items for the final treatment phases were a Goldfish cracker for the PECS condition and a Doritos chip for the SGD condition. Procedures and scoring were the same as the baseline condition except for when the participant selected the neutral item. If the participant selected the neutral item, the CP delivered the Post-it. Often this resulted in the participant

pushing away or crumpling the item. The CP would then reset, prompt the participant to complete the request for the preferred item, and score the trial as incorrect.

Social Validity

To assess treatment acceptability, Nancy's parent completed a survey adapted from the model of treatment acceptability developed by Reimers et al. (1987) for each of the modified communication modalities (PECS and SGD). The survey included 15 Likert-type questions which pertained to the parent's understanding of the procedures and the parent's perceptions of the treatments' acceptability, effectiveness, adaptability, maintenance, timeliness, ease of use, and cost to maintain and implement. The 15 Likert-type questions, each with a scale from 1-6 (strongly disagree to strongly agree), resulted in a possible score range from 15-90. A lower score indicated lower treatment acceptability while a higher score indicated overall better treatment acceptability. After completing a survey for each communication modality, the parent was asked if she believed her child showed preference for one communication modality over another.

Modality Preference Assessment

Participant preference for AAC modality was assessed using a paired-stimulus preference assessment, where target responses across both modalities were reinforced on concurrent schedules. The preference assessments were conducted in two sessions with 10 trials each, half of which included the distance component in which the CP was a foot away from the table. For each trial, both communication modality, each featuring the same textured icon for the goldfish cracker, were placed on the table in front of the participant. Then the CP asked, "what do you want?" Preference was scored for a device when the participant selected it and completed the target behaviors. After the CP delivered the requested goldfish, the trial was reset. Preference for

each modality was determined by dividing the number of trials in which the device was selected by the total number of trials, then multiplying the result by 100.

Follow-up

Three follow-up sessions were conducted at 4, 6, and 8 weeks after the last intervention session concluded. Procedures for follow-up were identical to the intervention phases, except the participant was never prompted to make a correct response and access to the preferred items was contingent on an independent correct response. All follow-up sessions included the preferred AAC modality only.

Results

Treatment fidelity was 100% for both conditions in all three phases of baseline. For treatment in Phase 1, treatment fidelity was 97% for the PECS condition (range of 91-100) and 99% for the SGD condition (range of 87.5-100). For treatment in Phase 2, treatment fidelity was 98% for the PECS condition (range of 91-100) and 97% for the SGD condition (range of 87.5-100). For treatment in Phase 3, treatment fidelity was 96.5% for the PECS condition (range of 84.6-100) and 97% for the SGD condition (range of 80-100).

Figure 1 shows percent of correct responses per session for Nancy for each phase. Nancy made no correct responses during baseline for Phases 1 and 2. During the Phase 3 Baseline, Nancy averaged 19% correct responding in the PECS condition and 18% in the SGD condition. During the Phase 1 Treatment conditions, Nancy required 14 sessions to reach mastery criteria for the PECS condition and 13 sessions to reach mastery criteria in the SGD condition. It is important to note, after Nancy met mastery criteria for both conditions in Phase 1, a two-month, state-mandated lock down due to COVID-19 paused sessions. Once sessions resumed, reteaching occurred and Nancy met mastery criteria for both conditions again within five sessions. In

treatment session 26, Nancy lost motivation for the PB & J sandwich resulting in no response or inappropriate responding during a large portion of the remaining SGD conditions.

During the Phase 2 Treatment PECS condition Nancy required 7 sessions to reach mastery criteria. During the Phase 2 Treatment SGD condition she reached mastery criteria in 11 sessions. Prompt fading occurred more naturally in the PECS condition than the SGD condition. The device appeared to be cumbersome, causing Nancy to drop it several times while stepping toward the CP and requiring the helper to provide significantly more intrusive, hand-over-hand prompts.

During the Phase 3 Treatment PECS condition Nancy required 11 sessions to reach mastery criteria. During the Phase 3 Treatment SGD condition she again reached mastery criteria in 11 sessions. The distance component was no longer required in this phase and the focus for prompting was on her scanning and feeling both options with her hand prior to making a choice.

In the follow-up sessions, Nancy made independent, correct responses with every given opportunity for all phases.

Textured PECS vs. Textured SGD

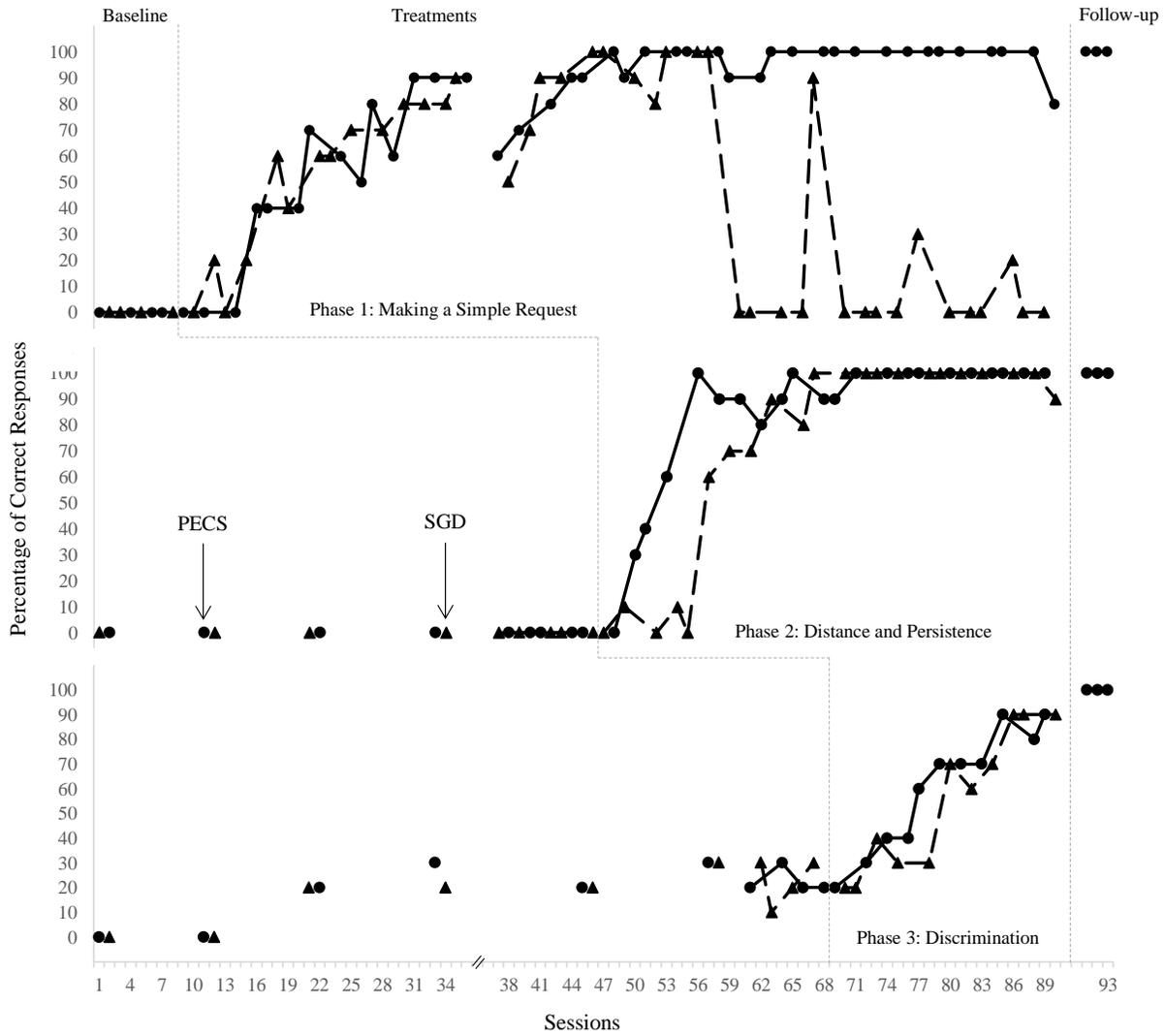


Figure 1: The percentage of correct responses for two modified AAC modalities on requesting in a child with ASD, VI and severe language delay.

Social Validity

The parent scored PECS with an 86 out of a possible 90 points. The SGD option received a 60 out of a possible 90 points. For the PECS survey Nancy’s parent scored all but two questions with a 6 (highest rating). The parent marked a 4 (slightly agree) regarding noticing

positive changes quickly and indicating the program was easy to implement. When asked to clarify, the parent explained that at first it was difficult for Nancy to remove the PECS card from the Velcro.

The responses to the SGD survey were much more variable. None of the questions were answered with the lowest option (strongly disagree), however, several responses were scored as disagreement. The parent did not believe Nancy would take away permanent benefits from the SGD. The parent also indicated that the SGD device itself was difficult to use and not easily adaptable. When asked to clarify, the parent responded, “the biggest issue is that she [Nancy] did not want to carry it around and changing the icons out was more complex.” The parent also indicated that she would not use the SGD in the future.

Modality Preference Assessment

When the parent was asked if she thought her daughter showed preference for one modality over the other, she responded in favor of PECS, stating that she believed “she feels like she’s actually having a conversation with someone, than just hitting a button.” During the paired-stimulus preference assessment of the two AAC modalities, Nancy responded in favor of the PECS cards. Every time the participant was required to walk to the CP, she chose the PECS card over the SGD. When sitting at the table with the CP, Nancy chose the SGD 30% of the opportunities, whereas the PECS card was chosen 70% of all opportunities.

Discussion

This study compared the effects of two modified AAC modalities on requesting skills with a child with autism and visual impairments. The participant reached mastery criteria in all three phases and learned to use both modalities to make simple requests, to travel a short distance to make requests, and to discriminate between two options when making a request. The

results indicate both the textured SGD and the textured PECS may be effective options for teaching children with multiple disabilities including ASD and VI how to make requests for preferred items.

The present study supports the previous literature that involved modifying traditional PECS protocol for individuals with multiple disabilities including VI. Nancy completed all three of the PECS phases at a comparable rate to participants in similar studies (e.g., Ali et al., 2011; Lund & Troha, 2008). In addition to supporting the previous literature, this study also expands the literature by comparing PECS and SGD with modifications for those with ASD and VI. Although more research in this area is still needed, the present study demonstrated little difference in acquisition rate and effectiveness between the textured PECS and textured SGD. The participant acquired requesting skills and demonstrated the target response for both AAC modalities across all three phases.

Although rates of acquisition were quite similar, there were slight differences across modalities. The participant visibly struggled to pick up and carry the SGD to the CP during Phase 2. The greater response effort for the Phase 2 SGD condition may have contributed to the slightly slower acquisition rate for that device. Overall, the modified PECS provided a faster acquisition rate by only 3 sessions. These results were consistent with the previous comparison literature which indicates both modalities are similarly efficient (Agius & Vance, 2016; Boesch et al., 2013; Couper et. al, 2014; Lorah et al., 2013; Roche et al., 2014; Sigafos et al., 2009; van der Meer et al., 2013).

By effectively teaching two different communication options, the present study was able to evaluate the social validity of each AAC program and to determine if the participant and her parent showed preference for one modality over the other. This is something that is lacking in

previous research for this particular population. If only one option had been made available, the participant may have learned to communicate but her preference for communication modality would have been unknown and she may not enjoy using the single presented option (Sigafoos et al., 2005). Were the parent had been presented with one option and had not found it acceptable, the learned communication may not be maintained (Miltenberger, 1990; Wolf, 1978). In the present study, both modalities received relatively high scores from the parent, however, the modified PECS modality was scored much higher. Furthermore, during the paired-stimulus preference assessment the modified PECS option was clearly preferred by the participant over the modified SGD option. The participant's mother stated that even though it seemed effective, the SGD option seemed too cumbersome for her daughter to use on a regular basis. In addition to the better utility, the PECS modality presented with more meaningful social validity for the parent. She stated that she would prefer to use PECS because she felt as though her daughter was communicating with her in a more conversational way, rather than hitting a button. It was for these reasons she decided to continue with PECS while discontinuing with the SGD. These findings support similar studies which encourage assessing social validity (Agius & Vance, 2016; Boesch et al., 2013; Miltenbberger, 1990; Wolf, 1978).

Limitations & Directions for Future Research

The first limitation was that the investigators failed to assess generalization of the procedures to novel environments, stimuli, and communicative partners. Generalizability is an important factor that may determine if the use of either of these communication modalities will produce long term benefits to the participant. Another limitation was interobserver agreement (IOA) data were not collected. This was mostly due to increased safety precautions implemented for the COVID-19 pandemic, which limited the number of people allowed to be present during

sessions. However, if another trained therapist was present to collect IOA data it would have provided more confidence that data were collected correctly. It is also important to note that video recording was considered. However, due to privacy reasons parental consent for video recording was not given.

The 7-Level Communication Builder was chosen for the SGD condition because textures could be easily adhered to the selection surface. Unfortunately, another limitation of the study was that the SGD was bulky and cumbersome for this particular participant. This delayed her independent completion of the target response and may have attributed to the slower acquisition rate for the SGD condition during Phase 2 and overall lower preference. Future researchers should consider other SGD options that could be modified and more easily utilized for individuals with VI. Lastly, the investigators modified the PECS protocol by adding a verbal cue to indicate an item was available. Although it may have been necessary to provide the cue, it may have also limited the participant's ability to self-initiate a request. Future researchers should consider other methods of prompting or prompt fading, such as a time-delay fading procedure, which would allow for more spontaneous and self-initiated requests.

Future research looking to replicate this study should consider counter-balancing request items across conditions. In this study the participant was always presented with the same item per condition, which was initially done to aid in discrimination between conditions. During Phase 1 in the SGD condition the participant became satiated with the peanut butter sandwich shortly after mastery criteria was reached. Had satiation occurred before mastery, experimental control would have been significantly weakened, and this possibility could be avoided to a degree by counter-balancing.

Another possible direction for future research would be to conduct a component analysis by examining the various feedback components (textures, sounds, other components of SGD devices, and other components of the PECS programs), rather than comparing the two. By examining the various components, future researchers may be able to provide a treatment that provides a combination of the most effective components to meet this population's needs.

The present study compared textured PECS to textured SGD and determined that although both modalities produced the desired outcomes, social validity and participant preference contributed to one modality being chosen over the other. Future research should continue to refine modified communication modalities, influenced by social validity and consumer preference, to determine best practices for increasing overall communication for individuals with ASD and VI.

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Appendix A

Picture examples of devices:

Modified PECS cards



Modified SGD

