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Review

Spontaneous communication in autism spectrum disorder: A review of topographies and interventions

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ABSTRACT

Lack of spontaneous communicative initiations appears to be a consistent problem in individuals with a diagnosis of autism spectrum disorder (ASD; Fujiki & Brinton, 2009). Spontaneous communication is emitted at a much lower frequency compared to individuals with language impairment and typically developing persons. Deficits of spontaneity in social interaction have been identified explicitly in the diagnostic criteria for autism, regardless of communication level or ability (American Psychiatric Association, 1994). In addition, without intervention 21–66% of children with ASD do not develop communicative speech (Lord & McGee, 2001). Individuals with autism rarely initiate appropriate speech and often fail to engage in typical social interactions such as asking questions, requesting information, expressing affection or requesting interactions (Carr & Kologinsky, 1983). This paper provides a review of the communicative topographies used to ameliorate spontaneous communication functions in individuals with autism and addresses the behavioral interventions that are used to induce such spontaneity.

Contents

1. Conceptualizing spontaneity

Spontaneous communication is creative, generative, and conventional. While there is general agreement regarding the importance of spontaneous communication, spontaneity as a construct has not been clearly or consistently defined in the wider literature (Ivey, 2009). In general, spontaneous communication is defined as communicative behaviors that occur in the absence of prompts, instructions or other verbal cues. Using such a conceptualization, individuals diagnosed with autism are said to lack spontaneity in their interactions as they are observed to rely on prompts (Reichle & Sigafoos, 1991). Prompts

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may include verbal instructions, modelling, and physical guidance. Chiang (2009) proposed that spontaneous expressive communication differs from elicited expressive communication in terms of quantity and quality. Using this concept of the relationship between antecedents and communicative acts, spontaneity can be explained from two perspectives: "binary" and "continuum" frameworks.

Briefly, a binary conceptualization is one in which spontaneity is viewed as an all-or-nothing phenomenon. The communicative act is either spontaneous or reactionary (Carter & Hotchkis, 2002). Spontaneity can also be viewed along a continuum. The continuum model acknowledges that each communicative act has some degree of spontaneity, from minimal to most intrusive for a speaker (Halle, 1987). From this perspective, a range of possible stimuli may play a role in controlling communication, including physical guidance, modelling, motivational operations for requesting, presence of objects, presence of a listener, and contextual stimuli.

In spite of the inconsistencies in terms of defining and conceptualizing spontaneity, it can generally be agreed that individuals with ASD often rely on prompts to evoke expressive communication (Chiang, 2009). Interestingly, while these individuals can emit communicative forms similarly to children with developmental delay and/or language impairment, they do not use spontaneous communication as frequently (Stone, Ousley, Yoder, Hogan, & Hepburn, 1997). Between 14 and 20% of 9 year olds with ASD are non verbal and are considered to have deviant language systems (Rice, Warren, & Betz, 2005). In behavior analytical terms, a spontaneous response is defined as "a verbal response to a nonverbal discriminative stimulus in the absence of a verbal discriminative stimulus" (Charlop, Schreibman, & Thibodeau, 1985, p. 156). Spontaneous, expressive communication allows individuals to communicate their needs and desires, to learn more about the world, to interact with peers and family, and to generally achieve control over their environment (Chiang & Carter, 2008). Spontaneous initiations are therefore necessary for individuals with ASD to be judged as socially competent during communicative exchanges (Wetherby & Prutting, 1984).

2. Interventions to increase spontaneous communication

Various interventions have been reported in the literature on Applied Behavior Analysis to increase spontaneous communication in individuals diagnosed with ASD. Speech may be targeted using a number of procedures, including discrete-trial training, time delay/prompt fading, milieu language teaching, direct instruction, script fading, and fluency training. Interventions can be peer-mediated or adult-mediated. Many individuals with autism may fail to develop speech and language skills (Lord & McGee, 2001). In such cases, a variety of augmentative and alternative communication strategies (AACs) may be used to facilitate spontaneous communicative behaviors and topographies that differ to vocal speech (e.g., pointing to desired objects or manual signing).

From a behavior analytic perspective, an understanding of the factors that may underlie unique deficits in spontaneous communication is essential. Learning characteristics that must be considered include joint attention skills, stimulus overselectivity, motivational variables, and reduced observation learning and imitative skills (Lovaas & Smith, 1989; Rogers & Pennington, 1991). Each of these behavioral phenomena plays a critical role in the development of language, communication, and social interaction (Baldwin, 1991). It is apparent that no single intervention to evoke spontaneity is effective for all individuals. Gerenser (2009) suggested that the only two consistent findings in terms of best outcomes are that the intervention must begin early and it must be intensive. Treatment programs often underestimate the amount of time required to develop social communication behaviors to a socially acceptable level. For individuals diagnosed with ASD, treatment must continue over an extended period of time and requires clinical resources and professional expertise (Fujiki & Brinton, 2009).

3. Augmentative and alternative communication strategies

Augmentative and alternative communication strategies (AACs) are a successful communication intervention for many individuals with ASD that have not developed speech. AACs can be used to either supplement existing speech or to serve as the primary method of expressive communication (Mirenda, 2003). These strategies can be divided into two broad categories, namely unaided AAC and aided AAC strategies. Unaided AACs do not require any equipment that is external to the body, and include manual signs and gestures. On the other hand, aided AACs rely on materials external to the individual's body, such as visual symbols (Lancioni et al., 2007). Irrespective of the method, the primary aim of AAC strategies is to compensate for the impairments of individuals with severe expressive communication disorders (Mirenda, 2003).

Previously, manual signs represented the most popular and frequently used AAC strategy. Sundberg (1993) suggested that many signed response forms closely resemble their referents. This implies that signing and sign acquisition may be easier than vocal response acquisition. However, the efficacy of the approach has been brought into question. For example, the amount of training required to establish only a few signs has been quite lengthy. Further, signs are not easily understood by unfamiliar communication partners, which may lead to frustration on the part of the speaker. Sigafoos, Drasgow, and Schlosser (2003) suggested that the relatively high teaching cost and the need to establish prerequisite skills such as eye contact and imitation, as well as the intelligibility of the approach, can be viewed as serious limitations of a manual sign program. A signing environment must also be established in which signs are consistently reinforced. This may be difficult to achieve due to a lack of available training and resources, as well as frequent staff turnover (Sundberg, 1993).

In the 1980s, manual signing combined with speech (''total communication'') was the AAC technique most popularly used. Casey (1978) investigated the effects of ''total communication'' instruction on the communicative and inappropriate behaviors of four children with autism. Findings revealed that both elicited and spontaneous vocal responses increased for all participants following ''total communication'' training. In spite of some of the criticisms of signing and ''total communication'', studies comparing the effects of teaching expressive language using speech, signing, or ''total communication'' report that signing or ''total communication'' training often results in quicker and more complete learning than speech training alone for many participants (Carbone et al., 2006; Yoder & Layton, 1988). Carbone et al. (2006) compared the effects of ''total communication'' and speech alone training on labelling responses of a child with autism. Significant differences in terms of the effectiveness of the two training conditions were reported, whereby the child produced over three times as many comments during ''total communication'' training relative to speech alone training.

There is some evidence in the autism research literature that natural speech may develop concurrently with manual signing as a result of ''total communication'' training (Goldstein, 2002). This depends largely on whether or not the learner has mastered generalized verbal imitation. Yoder and Layton (1988) reported that a verbal imitation repertoire accounted for 63% of the variance between those who demonstrated spoken language and those who did not following sign training.

More recently, manual signing has been replaced by the use of visual-graphic symbols. This shift occurred as a result of findings in imitation, iconicity, and intelligibility (Mirenda & Erickson, 2000). As a further example of the importance of prerequisite skills, Carr and Dores (1981) reported that the effectiveness of ''total communication'' largely depended on the generalized imitation repertoires of learners, whereby poor imitators made fewer receptive gains. On the other hand, the use of visual-graphic symbols require few prerequisite skills for individuals to make gains in communication. Additionally, the iconicity hypothesis suggests that symbols having a strong resemblance to their referents are easier to learn and remember than those with a weak resemblance (Fuller & Stratton, 1991). Findings are inconsistent regarding the iconicity of signing. Some suggest that many of the most basic signs fail an ''iconicity test'', while others argue that manual signing is more iconic than other AAC approaches (Mirenda & Erickson, 2000). Thirdly, one of the main reasons for the shift from manual signing to visual-graphic symbols has been a pragmatic one: Communication partners who are not familiar with manual signs are unlikely to be capable of communicating with individuals with ASD who have learned to sign. A study by Rotholz, Berkowitz, and Burberry (1989) highlights this point: Adolescents with autism were taught to use both manual signs and PECS to order food in a restaurant. None of the students' manual signs were understood, relative to successful request rates of between 80% and 100% when PECS were used (Rotholz et al., 1989). Thus, the intelligibility of an AAC approach is an important consideration when deciding upon which strategy to teach (Mirenda, 2003).

The picture exchange communication system (PECS; Bondy & Frost, 1994) is an effective aided AAC for children who have not developed functional speech. PECS is a pictorial system that uses basic behavioral principles such as differential reinforcement, shaping, and transfer of stimulus control to teach communication forms and functions (Charlop-Christy, Carpenter, Le, LeBlanc, & Kellet, 2002). Through shaping and explicit reinforcement contingencies, individuals learn to create a sentence using pictures (e.g., ''I want'' plus ''drink''), which is given to a communication partner (Bondy & Frost, 1994). In this way, PECS represents a naturalistic approach to teaching in which communication is child-initiated rather than prompt dependent (Koegal, 2000).

Functional communicative responses are the core focus of PECS, and these promote meaningful interactions between the individual and the environment (Charlop-Christy et al., 2002). Unlike signing, PECS does not require any demanding prerequisite skills and simply requires that the individual can indicate what he/she desires. Briefly, PECS begins by teaching a student to exchange a picture for a preferred item that is in full view, but not accessible other than by giving the picture to a communication partner. By receiving the desired item contingent on this response, it is expected that this will increase the frequency of the response. PECS moves through a number of phases following this basic contingency, as students learn to discriminate between pictures, to build sentences, to respond to questions, and to make comments (Lancioni et al., 2007).

PECS appears promising for several reasons. Firstly, it requires few prerequisite skills, which is in contrast to sign training. Secondly, the first skill taught is requesting or ''manding''. Requesting is important due to motivational considerations (Reichle & Sigafoos, 1991). It has been suggested that teaching requesting may be crucial to motivate the communication efforts of individuals, to increase their satisfaction, and to counteract and replace challenging behaviors (Lancioni, O'Reilly, & Basili, 2001). As well as this, PECS systematically targets spontaneity. The individual is taught to approach a communicative partner and to gain their attention by placing a picture symbol in their hand, thus initiating a communicative exchange (Preston & Carter, 2009). PECS is suitable for use in a variety of settings, including home, school, and play areas (Charlop-Christy et al., 2002).

Lancioni et al. (2007) provided an overview of published studies since the early 1990s on PECS as a communication topography. Of the 173 individuals across a range of studies who received training on PECS, only three could be classified as failures. Failures were categorized as individuals that made no progress, that made minimal progress, or that failed to maintain initial progress. An interesting finding outlined was that studies that succeeded in establishing multiple and various requests also reported an overall increase in verbal utterances related to requests made. Preston and Carter (2009) also reviewed the empirical literature on PECS. Consistent with Lancioni et al. (2007), the studies reviewed provided preliminary evidence that PECS may be efficacious for individuals with autism who have little or no speech. The authors reported that only three randomized controlled trials (RCTs) have been published to date. The bulk of all data available on PECS in the literature comes from single-subject studies. While findings reveal that PECS is a successful intervention that results in increased spontaneous communication, the number of studies remains relatively low (Preston & Carter, 2009).

Nonetheless, case reports and empirical studies have revealed that the system can be taught relatively rapidly (Carr & Felce, 2007), whereby teaching leads to increases in spontaneous communicative exchanges (Yoder & Stone, 2006) that maintain over time (Yokoyama, Naoi, & Yamamoto, 2006).

Voice output communication aids (VOCAs) are another popular aided AAC system. VOCAs are portable electronic devices that produce synthetic or digitized speech output. More specifically, the electronic devices translate a nonverbal behavior, such as pressing a picture on a device board, into synthesized or digitized verbal messages. Such verbal messages can be understood by parents, staff, and laypeople who may have no experience of VOCAs (Lancioni et al., 2007). Such speech output systems can be individualized, whereby persons can use them to communicate a small number of messages (e.g., "biscuit" and "chocolate milk"; Schepis & Reid, 1995) or a larger number of messages that include reasonably abstract concepts (e.g., "I need help please", "Let's do something else"; Schepis, Reid, Behrman, & Sutton, 1998).

While VOCAs are a more recent AAC system, some research is available demonstrating its efficacy for individuals with developmental disabilities such as autism. For example, Mirenda, Wilk, and Carson (2000) reported the effects of VOCAs over a 5-year period in communicative behaviors of 58 children with autism. Findings revealed that 53% of children were rated as successful or very successful, while a further 33% had some measurable degree of success. While a review of VOCAs by Lancioni et al. (2001) revealed positive effects on the strength and durability of communicative behaviors in individuals with autism, few studies have explicitly reported effects of VOCAs on spontaneous communication.

In sum, there are estimates that as many as 50% of individuals with autism remain mute over the course of their lives (Prizant, 1988). As a result, many communication interventions that aim to establish and/or increase spontaneous and interpersonal communicative behaviors in individuals with ASD look to augmentative and alternative communication strategies. AACs can be used to supplement existing speech or to serve as the main mode of expressive communication (Mirenda, 2003). The research reviewed in the current discussion reveals that AACs such as PECS, VOCAs, "total communication", and signing can successfully improve the communicative repertoires of individuals with autism who have not developed speech (Bondy & Frost, 1994; Carbone et al., 2006; Lancioni et al., 2001). Practitioners have a number of considerations to make when deciding upon which system to use, including the existing repertoires of the individual, the cost and practicality of the system, the amount of teaching time required, and the existence of competent listeners.

4. Interventions aimed to establish and increase spontaneous communication

A wide variety of interventions have been used to establish various communicative topographies in individuals with ASD. Some appear more successful than others in terms of establishing spontaneous communication. While it is not possible to present an exhaustive overview of interventions in the current paper, the aim is to describe a number of approaches that reflect current trends in the literature.

Traditional behavioral interventions teach communication in highly structured programs, often referred to as discrete-trial training (DTT). Various differential reinforcement and correction procedures, using modelling of responses and prompt-fading techniques, define this approach (Goldstein, 2002). Traditional DTT is characterized by one-to-one massed trial instruction that first focuses on skills such as eye contact, in-seat behavior, and attention, before attempts are made to develop skills such as matching, verbal imitation, receptive and expressive language, and play (Prizant, Wetherby, & Rydell, 2000).

While DTT has successfully taught communication using stringent operant procedures, questions have been raised as to whether this approach may interfere with individuals' abilities to spontaneously communicate (Goldstein, 2002). The key focus of traditional DTT has been on teaching individuals to become competent at responding. Critics have argued that this may result in a lack of initiation that could lead to passivity (e.g., Prizant, 1982). Indeed, some authors have suggested that highly structured teaching programs such as DTT may account for deficits in spontaneity (Chiang & Carter, 2008). As a result of this lack of communicative spontaneity and generalization in children who had mastered the communication goals of DTT, practitioners have examined alternative interventions. This led to a shift in behavioral approaches that promoted the use of more natural contingencies in which learning opportunities were initiated by the child, a hallmark that was in stark contrast to the traditional teacher-led DTT interactions (Prizant, 1988). Some research suggests that incorporating a choice and taking the child's lead when selecting target stimuli for communication training may improve the effectiveness of the intervention (e.g., Hart & Risley, 1995). Other important variables include task variation, stimulus variation, and the use of more natural reinforcers (Saunders & Sailor, 1979). Combining such procedures appears to closely match natural environmental contingencies. Further, these procedures may motivate individuals to make communicative attempts (Koegal, Camarata, Koegal, Ben-Tall, & Smith, 1998).

Teaching strategies in the 1980s were introduced that deviated significantly from traditional DTT approaches by including a combination of the aforementioned procedures. Milieu therapy (also referred to as "milieu language training" and "incidental teaching") is one such strategy. It focuses on teaching individuals new communication skills and behaviors within their natural environment (Mancil, Conroy, & Hayden, 2009). Procedures are designed to capitalize on individuals' desires and interests where teachers are encouraged to "follow the child's lead". That is, control of the teaching environment is shared, or it is moved from the teacher to the learner (Goldstein, 2002). Further, learner-selected activities provide the contexts and topics for communicative exchange. While the general approach of milieu therapy has reported success in increasing vocabulary, maintaining communicative skills, and facilitating unprompted use of language, specific techniques used vary greatly from study to study. Mancil et al. (2009) provided a general overview of the procedures used in a "milieu

therapy" intervention, including: modelling desired responses; correction procedures; time delay procedures; all occurring in the natural environment. Many procedures used appear similar to those used in DTT, and given that the approach is an integration of various teaching techniques, it is unclear what specific components may be responsible for increases in spontaneous communication. Nonetheless, there is evidence for the effectiveness of the approach.

While milieu language training often teaches an individual to make a request due to high motivation inherent in such a procedure, a review by Goldstein (2002) revealed a variety of communication functions that have emerged from milieu therapy interventions, including descriptions of drawings, social phrases such as "please/thank you/you're welcome", and positive interactions with peers. However, the reviewer suggested that there is a significant overlap between procedures employed by milieu therapy and DTT. There is no conclusive evidence that milieu therapy is more effective than DTT procedures when comparison studies have been conducted (Goldstein, 2002). Elliott, Hall, and Soper (1991) used DTT and a natural language technique to teach receptive and expressive communication to individuals with intellectual disabilities. No significant differences in acquisition or generalization of communicative repertoires were found, which is particularly noteworthy due to the reported generalization failures of DTT approaches (e.g., Prizant et al., 2000).

One procedure that is often used as part of a natural language teaching program is time delay. Time delay is a prompting procedure in which a delay is imposed between the presentation of a stimulus and a prompt. For example, a teacher may produce a vocalization and wait a number of seconds for the learner to imitate the vocalization before prompting the echoic response (Ross & Greer, 2003). Time delay procedures can be used to establish rapid and generalized language productions. Charlop and Walsh (1986) found that implementing a time delay procedure was associated with spontaneous speech productions, while modelling was not. Charlop et al. (1985) used a time delay procedure to teach children with autism to spontaneously request desired objects, i.e., to spontaneously request or mand. During training, an object was presented, and the teacher modelled the correct response, e.g., "I want biscuit". Upon imitation, the object would be presented to the child. Time delay began by presenting the object and waiting 2 s before modelling the desired response. If the child correctly requested the item within 2 s, it would be given to him/her. Delays were increased by increments of 2 s. Results revealed that all 7 children learned from the time delay procedure to spontaneously request items without any verbal prompting. The spontaneous speech also generalized from the training environment. Matson, Sevin, Fridley, and Love (1990) also demonstrated the effectiveness of a graduated time delay procedure to increase spontaneous verbalizations in 3 children with autism diagnoses. Social verbal responses including "please", "thank you" and "you're welcome" were shown to be used independently by all participants following a gradual increase of a time delay procedure from 2 s to 10 s or until a spontaneous response had been acquired. Generalization across other stimuli and settings was demonstrated for all participants and follow up probes using trained and novel materials showed maintenance of the spontaneous verbalizations taught.

A number of approaches that have been utilized in the field of behavior analysis but, until recently, have not been applied to spontaneous communication training merit discussion. These include script fading and fluency training. Krantz and McClannahan (1993, 1998) investigated the effects of script fading on spontaneous communicative repertoires of individuals with autism. Specifically, written or audiotaped scripts that provide models of appropriate language are made available for learners. These scripts contain phrases and sentences that are relevant in certain social situations and environments. Individuals are encouraged to approach a communication partner with a script, and repeat the phrase or sentence to him/her. When individuals begin to correctly and functionally use scripts, the scripts are gradually faded. For example, a script reading "Watch me jump" may be faded to "Watch me", then to "Watch", then to a blank script, and finally to no script (Brown, Krantz, McClannahan, & Poulson, 2007). It has been found that script fading can be used to successfully teach conversational skills in individuals with ASD. Krantz and McClannahan (1993) used written scripts to teach four children with ASD to initiate conversation with peers about recently completed activities. These scripts were then gradually faded and resulted in an increase in spontaneous generative language that previously had been lacking. Similarly, audiotaped scripts were used in a later study to teach four adolescents with ASD to converse with adults (Stevenson, Krantz, & McClannahan, 2000). Following fading and eventual removal of the scripts, unscripted statements and questions to adults increased. Importantly, script fading uses few or no verbal prompts, while teacher-delivered reinforcement is made available only after sessions conclude.

Fluency building has only very recently been applied to establish spontaneous communication in individuals with ASD. Fluency is a measure of accuracy plus speed of performance. Fluency focuses on rate of responding, rather than mere accuracy, and has been proposed as an alternative to traditional educational measures of success (Binder, 1996). Over 35 years of precision teaching research has demonstrated the superiority of fluent performance on student outcomes when compared with accuracy measures (Haughton, 1972). Findings reveal that it is fluency that bridges the gap between mere acquisition and truly useful performance (Binder, 1988). Specifically, fluent performance is related to improved retention, improved attention span and resistance to distraction, and the emergence of untrained complex behavior (Binder, 1987). While fluency building has improved academic performance in a number of areas, including reading, writing, and arithmetic, its application to individuals with ASD is not common at present. Nonetheless, it appears to be a method of teaching that could hold promise for a population that often demonstrates little generalization of skills learned from traditional teaching methods. Fischer, Howard, Sparkman, and Moore (2010) used fluency building to improve communication of four children with ASD. Participants were presented with a number of pictures in an order of noun-verb-object. These pictures showed individuals in routine daily living activities that could be described using a subject, a verb, and a direct object (e.g., "the boy is cleaning the table"). Participants were asked to describe the photographs (e.g., "what is happening here?"), and were

immediately presented with a model prompt that was gradually faded and delayed. Training continued until at least 80% fluency was recorded on photograph trials for three consecutive sessions. Participants demonstrated an increase in generative complex language by making spontaneous, novel responses to pictures that has not been presented in training (Fischer et al., 2010).

In terms of their application to teaching spontaneous communication, the two aforementioned approaches are certainly in their infancy. They do appear to hold promise, and have demonstrated efficacy in other areas of education, both for typically developing individuals and individuals with developmental and/or intellectual disabilities. Further, the likes of fluency building and script fading, as well as direct instruction (Engelmann & Carnine, 1982; Ganz & Flores, 2009) can be combined with other approaches, such as DTT, to provide multi-component interventions. This is a crucial area of research as no single behavioral intervention is effective for all individuals, and so, providing the practitioner with a number of interventions with demonstrated efficacy allows for greater flexibility in terms of individualizing communication interventions.

5. Conclusion

Individuals with autism spectrum disorder present with impairments in social interaction and communication (APA, 1994). One key deficit appears to be related to spontaneity of communication, which is, at best, lacking, and, at worst, non-existent. While it is a persistent problem, there is no "gold standard" in terms of intervention. Rather, researchers suggest that efforts to enhance communication should be based on an individual's abilities (e.g., Mirenda, 2003) and should adopt evidence-based behavioral teaching strategies. Given that as many as 50% of individuals with ASD may never develop speech (Prizant, 1988), augmentative and alternative communication systems are often the methods of choice. There has been a shift from signing and total communication to aided AAC systems such as PECS and VOCAs. Though not without criticism, such communication systems have established and increased spontaneous communicative behaviors in many individuals with autism (Bondy & Frost, 1994; Lancioni et al., 2007). Spontaneous speech has been the target of many behavioral interventions, including discrete-trial training, milieu therapy, time delay and prompt fading, peer-mediated interventions, direct instruction, and script fading. These approaches have been empirically shown to increase spontaneous communication in individuals with ASD. The state of the literature currently is that practitioners have a number of empirically supported treatment interventions available to them. The learner's strengths, deficits, and unique learning profile should guide the selection of these intervention strategies aimed to improve the spontaneous communicative repertoires of individuals with autism (Gerenser, 2009).

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