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SOCIAL POSITIONING: POSITIONING ADULTS WITH SEVERE AND MULTIPLE
DISABILITIES AND COMPLEX COMMUNICATION NEEDS FOR
SOCIAL INTERACTION

Dena R. Bonnike

154 Pages

This single case multiple probe study across dyads investigated the effects of social positioning on the nonsymbolic and symbolic communication of adult peers with severe and multiple disabilities and complex communication needs (SMD-CCN) when they were out of their wheelchairs. Social positioning referred to the positioning of adults with SMD-CCN in proximity and facing one another (no more than 3 ft apart) with access to speech-generating devices (SGDs) with appropriate messages for communicating and socializing with peers. After the social positioning condition, social positioning with training (modified aided language simulation) began to further evaluate the effects on the adults' communication and then maintenance data were collected. Videotapes of the adults were analyzed to collect event recording data of their nonsymbolic (eye gaze, reaching, and vocalization) and symbolic (SGD activations) communication. Data on the intentionality of SGD activations were collected and analyzed as well. Intentionality of SGD activation was recorded when that participant activated the SGD in response to interaction with a dyad partner (within 20 s of the dyad

partner using his or her SGD, vocalizing, reaching for, or looking at the partner) or when the participant activated the SGD 20 s before or after looking at, vocalizing to, or eye gazing to a dyad partner. The trend, level, and overlap of data points for each dependent variable were visually analyzed. During social positioning, participants communicated with their peers more often than when they were not positioned for the purpose of communication. Social positioning increased nonsymbolic and symbolic communication as well as the intentionality of SGD activation in adult peers with SMD-CCN and should be considered when out-of-wheelchair positioning is required. Results from the social positioning with training and maintenance conditions illustrated variable data. Staff members were overwhelmingly supportive of the idea of social positioning. Implications and future research were discussed at the conclusion of the study.

KEYWORDS: Adults with Severe and Multiple Disabilities, Social Positioning, Speech-Generating Devices

SOCIAL POSITIONING: POSITIONING ADULTS WITH SEVERE AND MULTIPLE
DISABILITIES AND COMPLEX COMMUNICATION NEEDS FOR
SOCIAL INTERACTION

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A Dissertation Submitted in Partial
Fulfillment of the Requirements
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SOCIAL POSITIONING: POSITIONING ADULTS WITH SEVERE AND MULTIPLE
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SOCIAL INTERACTION

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CHAPTER I
THE PROBLEM AND ITS BACKGROUND

Introduction

Individuals with severe and multiple developmental disabilities have various combinations of physical complications, intellectual and sensory challenges, adaptive skill needs, and complex communication needs. The physical limitations of these individuals can include difficulty moving, sitting, or using their upper extremities. Basic tasks such as walking, bathing, and getting dressed require additional assistance. Most individuals with severe and multiple disabilities also have substantial intellectual impairments which often lead to difficulty in learning and remembering how to complete daily tasks, socializing, and communicating messages regarding basic wants and needs. Given these areas of difficulty, it can be challenging to identify the abilities of individuals in this population; particularly, what they understand, express, and physically accomplish. Determining intellectual capabilities is difficult using standardized testing, especially because almost all of these individuals have complex communication needs making expressive language a challenge. However, despite these obstacles, a variety of supports are available to help people with severe and multiple disabilities achieve greater independence and quality of life. Informal means of evaluation can provide information on what individuals understand. Speech-generating devices (SGD) or other forms of augmentative and alternative communication (AAC) can be used to supplement nonsymbolic language, and adapted equipment can provide alternate positioning options

and mobility for people with the most intense physical needs (Turnbull, Turnbull, Wehmeyer, & Shogren, 2013). Simply, they are a diverse population of people “with interests, preferences, personalities, socioeconomic levels, and cultural heritages as varied as those of any of their peers” (p. 221). Unfortunately, our support of these individuals has not always been so pronounced.

For hundreds of years, many people with developmental disabilities were ignored or, even worse, victimized, neglected, or abandoned. Changes in attitudes about disability following the Parent Movement and normalization helped shift attitudes to a focus on abilities rather than disabilities in the last few decades and further improved the treatment of people and attitudes about people with developmental disabilities. Today, it is common to see individuals with developmental disabilities out in the community, in schools, and in workplaces thanks to laws and initiatives aimed at supporting individuals with disabilities. The Individuals with Disabilities Education Act permits free and appropriate education and special education services in public schools (U.S. Department of Education, n.d., Building the Legacy: IDEA 2004 section, para. 1), while the initiative of including students with disabilities in general education classrooms makes education more accessible. In addition, the Rehabilitation Act allows individuals with disabilities to participate in federally funded programs and protects them from workplace discrimination (Braddock & Parish, 2002).

While positive change continues to occur, there are still areas for improvement. Individuals with developmental disabilities such as cerebral palsy and intellectual disability are among many who often require extensive support to participate in their daily lives with independence due to their intellectual and physical challenges. In

particular, communicating using natural speech is complicated for them (Feeney, 2015). As the incidence of developmental disabilities continues to rise (Light & McNaughton, 2012), there are many more individuals who require assistance to maximize their communication for greater independence and quality of life.

Statement of the Problem

Communication is the right of every living being and is a part of everyday life (Bailey & Murray-Branch, 1993). It is important to maximize social communication for individuals with severe and multiple disabilities and complex communication needs (SMD-CCN) so that they may enjoy that right. McEwen (1992) contended that “one of the most important functional, educational goals for children with severe disabilities, a goal that is likely to be influenced by their positioning, is development of basic social-communication skills” (p. 635). Of course, the idea that positioning influences communication is similar for adults. The United States is home to approximately four million people who do not use natural speech to communicate their basic wants and needs (Feeney, 2015). Without the ability to communicate effectively or efficiently, these people are limited in their ability to participate in their own lives and the lives of others.

Interaction opportunities are as important for people with SMD-CCN as they are for anyone else. Communication allows us to acquire information, make decisions, express our preferences and emotions, and more (Hoge & Newsome, 2002). Socializing helps us to use that communicated information to foster friendships and have a feeling of social connectedness. A very limited research base exists to guide practitioners in developing basic social-communication skills for individuals with SMD-CCN. Plausibly, when we position these people so that they can communicate with one another, we can

facilitate the development of high-priority social-communication skills. The available research on social-communication focuses on the interactions between school-age participants and their communication with peers without disabilities or adults without disabilities. Studies showed that communication occurred most often for individuals with SMD-CCN in the general education setting with the majority of that communication initiated by adults without disabilities. In addition, almost half of any communication students with SMD-CCN had with their peers without disabilities was facilitated by adults (Carter, Sisco, Chung, & Stanton-Chapman, 2010; Causton-Theoharis, 2009; Causton-Theoharis & Malmgren, 2005a; Causton-Theoharis & Malmgren, 2005b; Chung & Carter, 2013; Chung, Carter, & Sisco, 2012; Girolametto & Weitzman, 2007; McEwen, 1992; McEwen & Karlan, 1989; McEwen & Lloyd, 1990). Research on the communication of peers with SMD-CCN could potentially add to that research base while providing important information about how individuals with SMD-CCN communicate with one another and how to position those individuals so that they can communicate most successfully.

Purpose

The purpose of this research was to (a) investigate the influence that positioning and positioning with participant training has on the communication between adult peers with SMD-CCN when they are out of their wheelchairs and provided SGDs with recorded social communication messages, (b) train direct care staff members in a congregate care setting to consider out-of-wheelchair time a period for peer socialization rather than merely pressure relief or relaxation time, (c) evaluate participant communication carryover through maintenance data collection, and (d) measure staff

interest through social validity surveys.

Significance of the Study

The findings of this study are important for adding to the knowledge base on the communication of individuals with SMD-CCN and for facilitating socialization among peers with SMD-CCN. Encouraging social interaction among peers with SMD-CCN provides a communicative outlet that is different than socialization with family members, teachers, and caregivers. This research will potentially help individuals with SMD-CCN increase their level of independence, develop their friendships, and improve their quality of life.

Research Questions

The following questions guided this investigation:

1. Will social positioning increase the nonsymbolic communication of eye gaze, vocalization, and reaching of adults with SMD-CCN?
2. Will social positioning increase the symbolic communication of SGD activation of adults with SMD-CCN?
3. Will social positioning increase the intentionality of SGD activation?
4. Will social positioning with participant training further increase the nonsymbolic and symbolic communication and intentionality of adults with SMD-CCN?
5. Will symbolic and nonsymbolic communication be maintained by adults with SMD-CCN?
6. Will staff members' perceptions of positioning change between the beginning and end of the study?

Definition of Key Terms

Social positioning: This term was used in this study to describe communicating socially with peers as opposed to communicating wants and needs and can be accomplished by placing individuals in proximity (no more than 3 ft) and having individuals face each other. Providing access to SGDs with appropriate messages for communicating and socializing with peers is also important for maximizing their symbolic communication.

Intellectual disability: This term was previously referred to as mental retardation. The current American Association on Intellectual and Developmental Disabilities (AAIDD) definition of intellectual disability is “a disability characterized by significant limitations both in **intellectual functioning** (reasoning, learning, problem solving) and in **adaptive behavior**, which covers a range of everyday social and practical skills. This disability originates before the age of 18” (2013, Frequently asked questions on intellectual disability section, para. 1)

Severe and multiple disabilities: The term *severe and multiple disabilities* was used in this study to describe individuals with severe to profound intellectual and physical disabilities who require assistance in all areas of their lives.

Developmental disabilities: This term is described by AAIDD as an umbrella term that includes intellectual disability, but also includes other disabilities that are apparent during childhood. Developmental disabilities are severe chronic disabilities that can be cognitive or physical or both. The disabilities appear before the age of 22 and are likely to be lifelong. Some developmental disabilities are largely physical issues, such as cerebral palsy or epilepsy. Some individuals may have a condition that includes a

physical and intellectual disability, for example Down syndrome or fetal alcohol syndrome (2013, Frequently asked questions on intellectual disability section, para. 3).

Complex communication needs: Complex communication needs refer to individuals with disabilities who cannot participate fully in activities of daily living due to significant challenges with speech and communication (Douglas, Light, & McNaughton, 2012).

Positioning: In this study, positioning refers to the physical body position of the participant at times when he or she was out of his or her wheelchair. This includes but is not limited to lying prone over a wedge or sidelying.

Nonsymbolic communication: Nonsymbolic communication is a nontraditional means of communicating, such as using vocalizations, reaching, or methods that are unique to the individual (Beck, Stoner, & Dennis, 2009; Brady et al., 2012; Snell, 2002).

Symbolic communication: For the purpose of this study, symbolic communication was defined as indicating one's thoughts by activating devices for speech, through written communication, or via picture symbol systems (Beck et al., 2009; Brady et al., 2012; Snell, 2002).

Speech-generating device: A speech-generating device is a mid-tech, battery operated device capable of recording and playing back speech in this study (Feeney, 2015). For this study, examples of this type of device included, but were not limited to, devices such as *LITTLEmack*[™], *LITTLE Step-by-Step*[™], and *LITTLE Step-by-Step with Levels*[™].

SGD activation: SGD activation was measured any time the participant activated his or her SGD or a switch connected to the SGD which caused the SGD to "speak" a

message or when that participant seemed to be activating the SGD in response to interaction with a dyad partner (within 20 s of the dyad partner using his or her SGD, vocalizing, reaching for, or looking at the partner)

Intentional SGD Activation: In this study, intentional SGD activation refers to when a participant (a) activates a SGD while looking at a partner; (b) activates a SGD, (as in response) no longer than 20 s after the dyad partner uses his or her SGD, vocalizes, reaches for, or looks at the participant; and (c) eye gazes to a partner first and then activates a SGD no longer than 20 s after or activates the SGD first and eye gazes to a partner no longer than 20 s after.

Reaching: For the purpose of this study, reaching was when a participant extended his or her upper extremity out in the direction of a peer as noted by upper extremity extension that was greater than the extension noted at rest.

Vocalization: A vocalization was any noise that came from a participant's mouth that occurred when that participant looked at a dyad partner or a vocalization that seemed to be in response to interaction with a dyad partner (20 s before or after the dyad partner used his or her SGD, vocalized, reached for, or looked at the partner). Any pause in vocalization resulted in the next vocalization being counted as a separate vocalization.

Eye gaze: Eye gaze was recorded when a participant looked in the direction of a dyad partner. If a participant closed his or her eyes longer than a typical blink and opened his or her eyes to gaze at a partner, this was counted as a separate eye gaze.

AAC: Augmentative and alternative communication refers to any form of communication excluding speech used to express oneself (Feeney, 2015). In this study,

AAC was most often used in reference to SGDs; however, the author recognizes that nonsymbolic communication in itself can be included under the umbrella of AAC.

Communicative intent: The definitions of intentional communication used in this study are similar to definitions used by other authors regarding participants' initiation of physical actions and vocalizations (Ogletree, Bartholomew, Wagaman, Genz, & Reisinger, 2012), communicative behaviors that are directed toward a partner (Iacono, Carter, & Hook, 1998), and persistence in communicating (e.g., activating a SGD followed by eye gaze to a partner) (Bruce & Vargas, 2007; Iacono et al.; Ogletree et al.) For the purpose of this study, communicative intent refers to when a participant (a) directs a reach with eye gaze or eye gazes toward a partner; (b) vocalizes or activates a SGD while looking at a partner; (c) activates a SGD, reaches, or vocalizes (as in response) no longer than 20 s after the dyad partner uses his or her SGD, vocalizes, reaches for, or looks at the participant; and (d) eye gazes to a partner first and then activates a SGD no longer than 20 s after or activates the SGD first and eye gazes to a partner no longer than 20 s after.

Best or optimal position: The physical position in which the participant can complete all of the target behaviors (e.g., sidelying on a wedge, in a stander)

Chapter Summary

The history of individuals with severe and multiple disabilities is an unfortunate one. As times and attitudes changed, we learned that these individuals were capable of so much more than ever imagined. However, new challenges emerged. Some of these challenges included recognizing their individualized communication and supporting them to be more independent communicators, providing more interaction opportunities, and

continuously providing awareness to others about their abilities. This study builds on the literature by examining the relationship between positioning and communication and how positioning can enhance communicative competence.

CHAPTER II

REVIEW OF RELATED LITERATURE

This chapter includes a synopsis of literature related to the development of language for individuals with and without developmental disabilities and how they differ. Further, this chapter incorporates the communication difficulties individuals with SMD-CCN encounter including the barriers to communication they face. The communicative interactions of these individuals with their partners are described as well as the role of communicative competence in communication. Chapter II closes with a summary of ways to increase and enhance the communicative interactions of this population with a review of the positioning and proximity literature.

Language Development

Language is “the systematic and conventional use of sounds (or signs or written symbols) for the purpose of communication or self-expression” (Hoff, 2014, p. 4). Language development is how we learn to communicate in our community or culture (Hoff). Communication is how we use that language to send and receive “information, ideas, feelings, or messages” (Hulit & Howard, 2002, p. 2). Communication may be symbolic or nonsymbolic. Symbolic communication includes, but is not limited to, speech, speech-generating devices, written language, sign language, or picture communication systems. Nonsymbolic communication is a nontraditional means of communicating, such as using vocalizations, reaching, or methods that are unique to the individual (Beck et al., 2009; Brady et al., 2012; Snell, 2002).

Receptive and Expressive Language

Language develops expressively and receptively. Very simply, expressive language is how thoughts are communicated (e.g., speech is the way we orally express language), whereas receptive language is how others' communication is received (i.e., attend to the communicator's message, remember the communicated message, and understand the expressed language of a communicative partner) (Hulit & Howard, 2002). There are many theories of how language develops, but the debate over whether it is innate or learned continues (Hoff, 2014; Hulit & Howard). Chronologically, however, newborns without disabilities begin communicating at birth by crying for a few basic needs. Over the course of the next several months, the number and types of sounds they make increase. By around 6 months, babies recognize their names, and as early as 8 months they recognize several words (Hoff). According to Hulit and Howard, "children communicate and interact socially with other people before they are able to produce language forms" (p. 37). This is noted by 9 months, when infants begin to be more social and demonstrate joint attention with caregivers. Typically, by the time children are 1 year old, they have words to speak to those caregivers (Hoff).

Semantics and Pragmatics

Under the umbrella of expressive and receptive language are semantic and pragmatic language skills. Semantic development is learning the meanings of words and how words together make new meanings (Hulit & Howard, 2002). This begins in infancy but becomes more complex as we age. According to Hoff (2014), learning the meaning of words is not the only factor in semantic development. Hoff noted that "children must be able to isolate words from the speech stream and remember these phonological forms.

Thus, phonological processes—in addition to cognitive and linguistic—are part of lexical development” (p. 166). As people learn and age, they build vocabularies comprised of many types of words so that they can communicate detailed messages. Over time, people also learn how to use that language appropriately; this is called pragmatic language development. Pragmatic language is the functional and appropriate use of language for communicative intent (Hoff; Hulit & Howard). For example, initiating, answering, commenting, or asking questions. Hulit and Howard noted that “children show evidence of communicative intent before they begin to use words, but when the child moves from prelinguistic to linguistic communication, pragmatics undergoes [sic] a significant evolution. Words allow for more specific intentions than gestures alone” (p. 132).

Differences in Language Development

Adults without disabilities are able to understand the messages their communication partners are trying to convey to them. They are able to express themselves specifically and appropriately to be able to communicate functionally with those communication partners. They do so by using receptive, expressive, semantic, and pragmatic language. The language development of people without disabilities follows the trend described previously, according to Van Der Schuit, Segers, Van Balkom, Stoep, and Verhoeven (2010). The language development of a child with intellectual disability does not follow exactly the same trend. Some of the language development might be similar to that of a child without disabilities, but the “timing and outcomes are more varied, and individual differences are more pervasive and often do not reflect the child’s developmental age” (Van Der Schuit et al., p. 204).

Communication Difficulties

Individuals who have SMD as a result of developmental disabilities (e.g., cerebral palsy, Down syndrome, or intellectual disability) or traumatic brain injuries often rely heavily on others to assist them with all of their needs (Roberts, Arthur-Kelly, Foreman, & Pascoe, 2005). With very few exceptions, these individuals also have CCN. By definition, individuals with CCN do not have fully efficient language skills. These individuals cannot speak functionally (Beck et al., 2009), use signs, or use communication pictures (Snell, 2002), and are restricted by communication challenges that affect their daily living (Clendon, Sturm, & Cali, 2013; Light, & McNaughton, 2013). People with SMD and CCN communicate, but they do so via alternative means. The way they communicate has been given many different names including *prelinguistic communication* (Alant, Bornman, & Lloyd, 2006; Boers, Janssen, Minneart, & Ruijsenaars, 2013; Brady et al., 2012), *emergent behaviors* (Ogletree et al., 2012), *presymbolic communication* (Brady et al.), *nonverbal communication* (Fey, Yoder, Warren, & Bredin-Oja, 2013), and *nonsymbolic communication* (Beck et al.; Snell). These terms can be considered synonymous, as they all indicate a customized vocabulary. *Prelinguistic* and *presymbolic* may be indicative of a stage before speaking, whereas *nonsymbolic* communication (e.g., gestures, vocalizations) may be used more frequently by individuals for whom speech is not expected to develop. Alant et al. argued that the term *nonsymbolic* implies that the individual has no understanding of language at all. The majority of the literature on nonsymbolic communication does not interpret the term that way.

It is unclear if there is one best term for people who communicate nonsymbolically. For the purposes of this study, the terms *presymbolic*, *prelinguistic*, and *nonsymbolic* were considered synonymously, and *nonsymbolic* was used to describe the meaningful yet nonspeaking communication of individuals with SMD and CCN, whether developmental or acquired in childhood. Furthermore, individuals with severe-profound intellectual and multiple disabilities who have CCN and communicate nonsymbolically were referred to as individuals with SMD-CCN, although there are undoubtedly some very rare exceptions.

Individuals with SMD-CCN may communicate nonsymbolically via any of the following: gestures, vocalizations, negative behavior, repeating routines (Snell, 2002), or in other ways that are difficult for unfamiliar communication partners to comprehend (Beck et al., 2009), such as eye gaze, body posture, touching others, or body movements (Brady et al., 2012). Individuals with SMD-CCN are often candidates for some type of AAC (e.g., picture communication systems, SGDs) to help them communicate symbolically. When using AAC, they may be able to turn nonsymbolic communication into symbolic communication by activating devices for speech, written communication, or indicating their thoughts via picture symbol systems. This symbolic communication is easier for unfamiliar communication partners to understand and increases the individual's communicative competence (CC).

Barriers to Communication for Individuals with SMD-CCN

Lack of familiarity with how to communicate with an AAC user may be the most significant barrier to successful communication exchanges between people with and without CCN. For example, a communication partner may not accept multiple means of

communication (only AAC), may not offer opportunities for AAC use, or may lack knowledge regarding positioning for AAC use, troubleshooting, or maintenance (DeThorne, Hengst, Fisher, & King, 2014; Light & McNaughton, 2014). Other less obtrusive but equally important barriers exist as well. Those barriers include, but are not limited to, (a) factors related to the individual with SMD-CCN, (b) factors related to communication partners, and (c) environmental factors. Table 1 includes a list of examples of each type of barrier.

Attitudes of Adults without Disabilities about Individuals with SMD-CCN

Adults without disabilities, in their roles as parents, teachers, and direct support workers, have a tremendous impact on the lives of individuals with SMD-CCN. The attitudes of others can greatly enhance or detract from the life experiences of people with SMD-CCN, particularly in regard to communicative interactions. DeBortoli et al. (2012) found that general education teachers in inclusive classrooms reported that it was difficult to communicate with students with SMD-CCN, that they felt like they were not qualified to instruct these students, and that students' frequent vocalizations interrupted teaching. The results of that study indicated that although teachers had good intentions about including students with SMD-CCN in their classrooms, those good intentions did not always translate into good practice. Carter and Hughes (2006) and DeBortoli et al. found that educators often encouraged the inclusion of all children with SMD-CCN in the general education curriculum; however, despite the positive attitudes about inclusion, many individuals with SMD-CCN were given restricted access to the general education curriculum as they progressed through their school careers.

Table 1

Types of Barriers to Communication for Individuals with SMD-CCN

Individual with SMD-CCN factors	<ul style="list-style-type: none"> • difficulty making conversation due to very slow conversational turn taking (Hemsley, Balandin, & Togher, 2008) • inability to compensate for communication breakdown in some way (Light & McNaughton, 2014) which can lead to communication failure • visual or hearing impairments and delayed reactions (Nijs & Maes, 2014)
Communication partner factors	<ul style="list-style-type: none"> • staff members who become physical barriers to individuals with CCN making it difficult for them to interact with others (Causton-Theoharis & Malmgren, 2005b) or staff members who relocate individuals away from their peers for “logistical or convenience reasons” (Causton-Theoharis & Malmgren, 2005a, p. 19) • failure to pause long enough for AAC user to respond or initiate communication • being ignored by peers without disabilities when trying to enter a conversation or when vocalizations are unintelligible (Weiner, 2005) • communication partners who accidentally impede the communication of individuals with CCN by not allowing AAC users to answer more than yes or no questions (Kent-Walsh & McNaughton, 2005) or who monopolize conversation (Clarke & Wilkinson, 2007) • low expectations and advocacy of families on behalf of the AAC user (Lund & Light, 2007) • negative attitudes and perceptions of adults and peers (Dudek, Beck, & Thompson, 2006)
Environmental factors	<ul style="list-style-type: none"> • poor environmental arrangement, no communication aid offered, not changing communication partners, no opportunities for choices, preferences, routines, etc. • environmental supports become barriers if they are not in place (e.g., legislation, poor service delivery, decreased advocacy, decreased knowledge, decreased AAC partner skills) (Light & McNaughton, 2014) • inappropriate device layout, selection technique, or ease of understanding of the user’s AAC by the caregiver (Light & McNaughton, 2014), limited support from an AAC specialist for device programming (DeBortoli, Balandin, Foreman, Arthur-Kelly, & Mathisen, 2012) • not being offered AAC devices, devices not within reach, or being provided with AAC that is not a preferred means of communication (Chung, Carter, & Sisco, 2012)

Without the ability to be included consistently and interact socially with a variety of individuals, people with SMD-CCN have limited opportunities to practice their social skills and to develop relationships. To this point, Johnson, Douglas, Bigby, and Iacono (2010) used qualitative research to conclude that the positive attitudes of adults toward individuals with SMD-CCN are one of the most important factors in regard to establishing meaningful and long-term social relationships. They noted that when staff members shared their time with an individual with SMD-CCN in the form of having fun (humor and humorous routines), the result was laughter. Laughter further stimulated social interactions; however, humor was noted to be less common among peers with SMD-CCN.

Attitudes of Peers without Disabilities about Individuals with SMD-CCN

The attitudes and perceptions of peers without disabilities can impact the quality of life and social experience of individuals with SMD-CCN. Individuals with SMD-CCN are less likely to be accepted by their peers without disabilities because of their differences (Beck, Thompson, Kosuwan, & Prochnow, 2010). Female peers without disabilities, however, have more positive attitudes toward peers with SMD-CCN (Beck et al., 2002; Dudek et al., 2006; Litvack, Ritchie, & Shore, 2011). The findings on the attitudes of peers without disabilities toward peers who require AAC are similar to the attitudes of the students without disabilities toward peers with SMD-CCN in general (Dudek et al.). Dudek et al. reported that neither the type of AAC device used nor the grade level of the peers without disabilities affected their attitudes toward individuals with SMD-CCN. Average and higher-achieving students did not appear to have negative attitudes about their peers with SMD-CCN though higher-achieving students did report

that the inclusion of these students negatively impacted their own learning experience (Litvack et al., 2011). Overall, despite the fact that individuals with SMD-CCN are at risk for nonacceptance by peers without disabilities, attitudes about individuals with SMD-CCN are relatively positive. It appears as though the biggest factor in positivity and acceptance is intrinsic to each individual peer based on his or her familiarity with individuals with disabilities (Beck et al., 2010).

Communication Patterns of Communication Partners

Communication partners (peers or adults without disabilities) who are not trained to communicate with people who have SMD-CCN are more likely to miss chances at friendly relationships with individuals with SMD-CCN (Causton-Theoharis & Malmgren, 2005a; Causton-Theoharis & Malmgren, 2005b; Chung et al., 2012). A lack of training for peers without disabilities could lead to some discomfort in the initiation or maintenance of a conversation. For example, in a school setting, a person with SMD-CCN may be paired with an untrained paraprofessional who regularly removes him or her from the inclusive setting or accidentally disrupts communication with peers without disabilities (Causton-Theoharis & Malmgren, 2005a; Chung et al.). This disruption becomes a barrier for both communication partners. To this point, it is important for individuals without disabilities to be trained on how to communicate with individuals with SMD-CCN or how to facilitate communication between individuals with SMD-CCN and others.

Communicative Interactions of Individuals with SMD-CCN

Children with SMD-CCN Communicating with Adults

In a study of the social interaction of students with a variety of disabilities who used AAC and/or nonsymbolic communication, Chung et al. (2012) observed 16 students over a 12-week period. Twelve of the students used various types of AAC, but were mainly nonsymbolic communicators. The students' interactions were characterized by the following:

Verbal and/or nonverbal behaviors (e.g., facial expressions, gestures, pictures, signs, devices) produced by the focus student toward a specific person (e.g., a classmate without developmental disabilities or a paraprofessional) or produced by a specific person toward the focus student (p. 356).

Chung et al. (2012) found that approximately 84% of the observed communicative interactions were between the students with disabilities and adults. Another 6% of the communicative interactions were among students with disabilities and peer-adult combinations (Chung et al.). In addition, 3 of the 16 students with disabilities had no interaction during the study (Chung et al.). The amount of time children with disabilities spent in communicative interactions with adults indicated the limited communicative interaction time that these students with disabilities had with their peers. About 48% of all interactions were under 5 s long and only about 14% of the total interactions were initiated by the students with disabilities (Chung et al.). When students with disabilities initiated interaction, they received responses nearly 100% of the time (Chung et al.). The decreased length of interactions and number of initiations is an indicator that adults talk during most communicative interactions with children with disabilities.

Chung et al. (2012) also noted that students with severe disabilities communicated most often with facial expression, gestures, vocalizations, speech, and AAC, in that order. The students used “body movements, challenging behaviors, writing, and signs” (p. 360) less frequently than the aforementioned modes of communication (Chung et al.). Chung et al. concluded that the function of the students’ communication with adults was mostly for the expression of wants and needs followed by providing information and least often for social means. Additionally, Chung et al. showed that students who communicate nonsymbolically do, in fact, communicate and communicate for specific purposes based on the target of their communication. The authors also showed that students who communicate nonsymbolically receive few chances to have social interactions with peers who do not have disabilities, and adults dominated communicative interactions.

Children with SMD-CCN Communicating with Peers

In Chung et al.’s study (2012), only about 5% of the total interactions observed and recorded were between students with disabilities and their peers without disabilities (Chung et al.). Interestingly, the authors found that when students with disabilities communicated with peers without disabilities, about 65% of the communicative function was for the purpose of “developing social closeness” (p. 361), which was not the case when they interacted with adults. Foreman, Arthur-Kelly, Pascoe, and King (2004) found that students with SMD-CCN communicated more often in general education classrooms (49%) than in segregated classrooms (27%). This study corroborated Chung et al.’s findings that a greater number of interactions in either setting were with peers without disabilities. The results of these studies suggest that students with disabilities and their peers without disabilities want to and attempt to communicate when they have the

opportunity.

Communication Among Only Individuals with SMD-CCN

There is little research on the communication between two communication partners who both have CCN, particularly when the partners have SMD-CCN. Nijs and Maes (2014) noted that in studies with students who have SMD-CCN, there are more interactions with peers without disabilities than peers with SMD-CCN. Little if any information about the communication of adult communication partners with SMD-CCN is available.

Communicative Competence

Communicative competence (CC) is a construct that has evolved over decades. According to Teachman and Gibson (2014), the construct expanded with every variation from Chomsky to Hymes to Canale and Swain. The most widely used definition of CC in the communication intervention literature is the definition established by Light (1989), which states that CC is the “quality or state of being functionally adequate in daily communication and of having sufficient knowledge, judgment, and skills to communicate effectively” (p. 138). In more recent research, Light and McNaughton (2014) explained CC as a process explaining that “the attainment of communicative competence does not require mastery of the art of communication” (p. 1). This definition indicates that individuals can demonstrate various levels of the requirements of CC and still be effective communicators. Light and McNaughton further noted that CC can differ among communication partners, across settings, and with the purpose of the communication. The marriage of language, communication, social interaction, and knowledge of how to use them is essential to being a successful communicator. In order to be successful

communicators, individuals with SMD-CCN require assistance from others to increase communicative intent. Assistance may be in the form of learning a mode of communication, the training of a partner, or environmental changes.

Increasing Communicative Interactions and Communicative Competence

There is a body of research demonstrating ways to increase the CC and the communicative intent of these individuals. Prelinguistic milieu teaching (PMT), functional communication training (FCT), discrete trial training (DTT), and aided language stimulation (ALS) are among some of the methods used to increase the communication of individuals with SMD-CCN. In addition to these instructional methods, supports are needed for the individual with SMD-CCN and training is beneficial for communicative partners. The combination of systematic instruction with appropriate positioning, supports, and training helps to facilitate the CC of individuals with SMD-CCN.

Prelinguistic milieu teaching (PMT). PMT is a method often used with children who have little or no speech and who also have difficulty producing nonsymbolic communication (Fey et al., 2006; Fey et al., 2013). According to Fey et al. (2006), PMT teaches “gestures, vocalizations, and coordinated eye gaze behavior” (p. 526) or any combination of those components during social interactions that are naturalistic. PMT is a variation of milieu teaching (MT) in that MT is used to increase verbal communication such as speech or sign language (Fey et al., 2013). Fey et al. (2013) acknowledged that a child can move on from PMT to MT if he or she is successful and then the model is referred to as milieu communication teaching (MCT). PMT is used in combination with

responsivity education (RE) where caregivers and communication partners are trained on how to best respond to the individual with CCN (Fey et al., 2013). The focus of RE is to (a) be more aware of the communicative attempts of the child, (b) wait for the child to attempt nonsymbolic communication, (c) share attention with the child, and (d) respond to those communicative attempts with symbolic and nonsymbolic communication (Fey et al., 2006). The combination of PMT and RE had a significant effect on the development of nonsymbolic language in experimental and case studies (Fey et al., 2006; McCathren, 2000); however, it appears that the effects of this treatment may only occur during treatment with little carryover (Warren et al., 2008), and further research on the dosage of treatment is needed (Parker-McGowan et al., 2014).

Functional communication training (FCT). FCT is “an intervention frequently used for individuals with intellectual disability and related developmental disabilities to reduce problematic behaviors and to increase prosocial behaviors” by reinforcing a preferred behavior while extinguishing a nonpreferred behavior (Casey & Merial, 2006, p. 46). This method was successful in two studies on teaching individuals with SMD-CCN to communicate effectively using SGDs when the devices replaced less desirable behaviors (Byiers, Dimian, & Symons, 2014; Radstaake et al., 2013). This method was also shown to be successful with adults with SMD-CCN for replacing negative behaviors with functional communication in a vocational setting (Chezan, Drasgow, & Martin, 2014).

Discrete trial training (DTT). DTT is a teaching method that has been used mainly with students with autism spectrum disorders for many years (Downs, Downs, Fossum, & Rau, 2008). This method is comprised of several very short instructional

units and involves five steps (Downs et al.). The five steps include: (a) a stimulus question or command, (b) an immediate prompt to the response from the instructor, (c) student response, (d) consequence, and (e) a pause before the next trial (Downs et al.). This method was used successfully to teach early academic, social, fine motor, and life skills to a variety of students with various disabilities (Downs et al.; Downs, Downs, Johansen, & Fossum, 2007) and vocational skills to adults with intellectual disabilities (Chezan et al., 2014).

Aided language stimulation (ALS). ALS is a way to teach receptive language skills to individuals with CCN to improve their understanding of vocabulary and increase their ability to use expressive language (Dada & Alant, 2009). This method involves a communication partner who points to picture symbols for the individual with CCN while simultaneously using language stimulation to expand the meaning of the picture (Dada & Alant). According to Dada and Alant, the partner should comment on pictures to the individual with CCN without asking too many questions and should point to pictures about 70% of the time while speaking. Researchers who used ALS successfully trained adults with CCN how to use AAC for “functional symbolic communication” as measured by the increased number of communicative turns and AAC use (Beck et al., 2009, p. 50). It was also used successfully for children with moderate intellectual disability to learn symbols (Harris & Reichle, 2004), and with children with CCN to improve vocabulary (Dada, Granlund, & Alant, 2007).

AAC supports. AAC systems are intended to augment a person’s communication abilities. It is extremely important for interventionists to remember that no matter how severe a person’s disability, practically all people communicate in some manner in order

to tell others that they are upset, want attention, or are trying to control their environment in some way. Interventionists need to carefully examine and make note of how a person communicates—whether it be through movements, sounds, or behaviors. AAC systems should enable a person’s communication to expand and become more efficient and effective; however, the systems should never be designed to take away a communication modality that a person already uses.

Although people with SMD-CCN communicate nonverbally, they may require AAC intervention in the form of SGDs, pictures, or other means to augment, but not replace, the communication modes they are already using. AAC intervention is paradoxically the simplest yet most difficult intervention for individuals with SMD-CCN. Choosing whether or not to use this form of communication may be the easiest step. Securing a device that is a good fit for a person is the difficult part, as it requires access to resources as well as expertise. Sutherland et al. (2014) noted the need for AAC for adults in congregate care facilities (28.8% of individuals were candidates for AAC and 24% had no AAC available); however, AAC seems to be more difficult to acquire for adults than for children. Lack of funding for AAC, as well as negative family and caregiver attitudes, can be barriers to acquisition (Light & McNaughton, 2014) and can sabotage the attempt for increased CC. The sole objective of AAC intervention is to increase CC (Light & McNaughton; Teachman & Gibson, 2014). However, for CC to be realized with AAC, the user has to have some understanding of (a) the language and/or symbols of the AAC; (b) how to access the device (e.g., pointing, eye gaze, scanning); (c) when it is appropriate to use the AAC; and (d) strategies to manage his or her limitations when AAC breakdown or environmental barriers occur (Light & McNaughton). One or more

of the aforementioned interventions can be used in combination with AAC to enable individuals with SMD-CCN to become competent communicators with their devices. Furthermore, Light and McNaughton noted that it is the “motivation, attitude, confidence, and resilience” (p. 4) of the AAC user that will ultimately push him or her to demonstrate CC with AAC. The benefits of AAC for children with CCN include, but are not limited to, increased “turn taking, requesting, commenting, receptive and expressive vocabulary, mean length of message, morphology, phonological awareness, and reading and writing skills” (Light & McNaughton, p. 35).

These benefits are likely similar for adults, but few studies seem to focus on AAC for adults (Hagan & Thompson, 2013). In a case study of a woman with moderate intellectual disability, Hagan and Thompson noted that when provided with AAC intervention, the participant demonstrated increased CC, increased interactions across settings, an improved perception of her quality of life, and fewer communication breakdowns.

Communication partner training. After considering how to improve the CC of individuals with SMD-CCN, it is necessary to consider other factors that lead to the improved quality of communicative interactions with and for these individuals. Communication involves more than one person and so may involve an adult, a peer, or a peer with disabilities. Kent-Walsh and McNaughton (2005) noted that in previous research, it was evident that communication partners without disabilities needed to be taught how to communicate with individuals with CCN. They further noted that training was needed particularly for those who use AAC.

Adult partner training. There are a number of ways adults can support children and other adults with SMD-CCN for improved communication and a better overall social experience. When interacting with these individuals, adults (e.g., teachers and paraprofessionals) should be aware of physical-environment variables as well as their own nonverbal behaviors that can improve communication. Table 2 contains a list of these variables.

Table 2

Variables in Adults without Disabilities Partner Training

Physical- Environmental Variables	<ul style="list-style-type: none"> • determine the preferred physical position and preferred social partners for the most alert behavior if possible (Arthur-Kelly, Bochner, Center, & Mok, 2007) • determine the best environmental setting for the most alert behavior if possible (Arthur-Kelly et al., 2007; Foreman et al., 2004) • face each other and provide extra time for responses (Douglas et al., 2012) • stay in proximity to one another during communication (Arthur-Kelly et al., 2007; Chung et al., 2012) • keep the individual within reach of his or her AAC device as needed (Chung et al., 2012) • make sure glasses and hearing aids are present and functioning as needed
Communication partner nonverbal behaviors	<ul style="list-style-type: none"> • engage the individual in motivating activities that are developmentally appropriate to encourage communication (Douglas et al., 2012) • provide plenty of opportunities for communication (Clarke & Wilkinson, 2007; Douglas et al., 2012) or even a well-timed pause to stimulate a response • practice being responsive to all communication attempts (Arthur-Kelly et al., 2007) • ask more than just yes-or-no questions (Kent-Walsh & McNaughton, 2005) • allow the individual to communicate using multiple modes of communication (DeThorne et al., 2013) • do not interrupt the individual with CCN while he or she is conveying his or her message and focus on the person, not the mode of communication (Kent-Walsh & McNaughton, 2005)

Following these suggestions can increase the success of a social interaction between an adult without disabilities and a person with SMD-CCN. This can then lead to a better understanding of the individual's communication and a more fulfilling relationship for both parties.

Peer (without disabilities) partner training. Peers can be trained as well as adults to have effective social interactions with individuals with SMD-CCN. In fact, Causton-Theoharis and Malmgren (2005a) noted that there are several studies showing that peers trained to work with students with disabilities resulted in positive outcomes in a variety of learning situations for the individuals with disabilities. The peer training should teach many of the same strategies for adult interaction to peers without disabilities (e.g., do not interrupt, provide wait time, communicate facing each other, stay in proximity to one another, keep the AAC device close to the individual, ask more than yes-or-no questions, and be responsive). Table 3 contains a list of additional recommendations for adults when facilitating peer partner training (Causton-Theoharis & Malmgren, 2005a).

Table 3

Additional Variables for Adults who Facilitate Peer Partner Training

-
- point out the students' similarities
 - decrease supports
 - talk to the student with SMD-CCN instead of talking about him or her
 - create an environment full of social opportunity and tailor instruction to include social opportunities
 - create reinforcements that have to do with social interaction
 - create classroom jobs for students that involve socialization
 - create an environment where students have to depend on each other for success
-

Furthermore, in order to increase socialization between peers without disabilities and peers with disabilities, adults should not become a physical obstruction between the individual with SMD-CCN and his or her communication partners or move him or her away from peers (Causton-Theoharis & Malmgren, 2005a). These suggestions should be used to train peers without disabilities how to interact with students who have SMD-CCN in order to expand the social opportunities of both partners.

Training peers with SMD-CCN. There is little information about the interactions between two or more individuals with SMD-CCN. Foreman et al. (2004) observed students with SMD-CCN in general education and self-contained classrooms for an entire day and found that in self-contained classes, students with CCN had no communication partner for more than half of the time. When the students with SMD-CCN did have a communication partner, they communicated with the special education teacher 21% of the time and peers without disabilities 4% of the time (Foreman et al.). Foreman et al. found that in general education settings, students with SMD-CCN had communication partners slightly more often. When they did have a partner, they communicated with a paraprofessional 44% of the time and peers 17% of the time. Although this was only a 1-day observation, there was no mention of interactions between peers with disabilities at all.

Literature Search Procedures

I conducted a systematic review of the literature on the interactions of individuals with disabilities with a focus on positioning and environmental arrangement by electronically searching the PsycINFO, ERIC, Education Full Text, and Academic Search Complete databases. I hand searched the references of key articles to augment my

findings. I searched for articles related to the communication of peers with disabilities interacting with one another and how to foster that interaction. I searched for articles using a combination of primary and secondary search terms (see Table 4). The exclusion criteria for articles in this literature review included: (a) studies that did not include individuals with disabilities and CCN, (b) non-English articles, and (c) studies not focused on communication or positioning. These searches yielded 20 articles related to this topic.

Table 4

Keyword Search

The primary keywords *intellectual disability, developmental disability, mental retardation* were combined with the following secondary keywords or phrases:

1. Complex communication needs
 2. Communication
 3. Social*
 4. Peer*
 5. Student
 6. Adult
 7. Interaction
 8. Position*
 9. Proximity
 10. Environmental Arrangement
-

Note. *Indicates that multiple forms of the word were searched. Further, secondary keywords or phrases were combined.

Students with Disabilities and Their Peers without Disabilities

The literature regarding the communication of individuals with disabilities is largely focused on communication between peers with disabilities and peers without disabilities. In fact, a literature review of 85 studies showed that the majority of the literature is concerned with these dyads (Carter, Sisco, Chung, & Stanton-Chapman,

2010). Many studies show that there are positive outcomes to communication between peers with disabilities and peers without disabilities. One positive finding included increased social interactions (Chung & Carter, 2013) as well as conversations that were friendly and age appropriate when one peer used a SGD (Clarke & Wilkinson, 2007). This finding was corroborated by Chung, Carter, and Sisco (2012) who found that peers communicated more for social closeness than for wants and needs. When peers without disabilities were trained to communicate with students with disabilities, students with disabilities seemed happier, initiated more communication, dyads produced more reciprocal interactions, and adult interference was decreased (Nijs & Maes, 2014). Some authors noted that increased communication between these dyads occurred in a general education setting versus a segregated setting (Nijs & Maes). Specifically, Arthur-Kelly, Foreman, Bennett, and Pascoe (2008) found that 17% of a student's day was filled with peer interaction in the general education setting versus 4% when in a segregated setting.

Students with Disabilities and Adults without Disabilities

Students with disabilities communicate most often with adults such as teachers and paraprofessionals. Chung, Carter, and Sisco (2012) found that in the general education environment, 84% of their interactions were with adults and 80% of that communication was initiated by the adults. Sadly, the communication of individuals with disabilities can go unnoticed or ignored. Houghton, Bronicki, and Guess (1987) found that only 7% of initiations in an unstructured setting were given a response. Given the appropriate training, however, adults offered more opportunities for students to communicate (Douglas, Light, & McNaughton, 2013).

Adult Communication Facilitation for Student

Peers without Disabilities

Although the majority of the literature on the communication of individuals with disabilities is about peers with disabilities and peers without disabilities as discussed previously, Carter et al. (2010) found that 40% of the research involved some sort of adult facilitation of communication for those dyads. When provided with training on how to facilitate communication by fading adult support, redirecting conversations to a peer, and providing access to SGDs, adults were able to facilitate communication with these dyads twice as much to produce 25 times more dyad interaction (Causton-Theoharis, 2009; Causton-Theoharis & Malmgren, 2005a; Causton-Theoharis & Malmgren, 2005b; Chung & Carter, 2013; Girolametto & Weitzman, 2007).

Communication Between Adults with Disabilities

and Adults without Disabilities

The literature on the interactions between adults with disabilities and adults without disabilities is limited. It appears to be even further limited as the disabilities become more significant. In a collection of case studies and two qualitative analyses, it became clear that adults with SMD-CCN generally communicate with only adults without disabilities (Johnson, Douglas, Bigby, & Iacono, 2010; Johnson, Douglas, Bigby, & Iacono, 2012; Olney, 2001).

Communication Among Student Peers with Disabilities

or Among Adult Peers with Disabilities

The literature that describes interactions among individuals with disabilities is sparse. In their literature review of 85 studies, Carter et al. (2010) found only nine

studies that involved the interactions of peers with disabilities. Johnson et al. (2010) mentioned one friendship including two peers with disabilities, but failed to elaborate on the communication of the dyad. Further, Nijs and Maes' (2014) review of eight articles regarding the interactions of individuals with profound and multiple disabilities was unable to uncover any information about how individuals with SMD-CCN interact with each other. This has been the case with similar literature reviews (Hostyn & Maes, 2009).

Social Communicative Interaction

Anticipating the communicative intent of those with severe and multiple disabilities (SMD) is often difficult due to their physical and cognitive limitations. Because of these limitations, it is necessary for communication partners to be familiar with the individual with SMD and sensitive to the idiosyncratic methods that he or she employs in his or her attempts to communicate (Dammeyer & Koppe, 2013; Ogletree, Bartholomew, Wagaman, Genz, & Reisinger, 2012). A study of four adults with severe intellectual disabilities showed that initiation of physical and vocal behaviors could be interpreted by a communication partner as a communication attempt (Ogletree, Bartholomew, Wagaman, Genz, & Reisinger). In fact, participants in this study made a total of 562 communication attempts with staff members in 15 min using facial orientation with or without vocalization (positioning face toward a partner), vocalization alone, and physical actions alone or with vocalization toward a partner or object. The authors, however, did not indicate if any of these attempts were intentional. Another study of four elementary aged children interacting with adult staff members showed 622 communicative attempts over two approximately 30 min sessions with seven intentional communicative acts in all (Iacono, Carter, & Hook, 1998). Somewhat contradictory, a

case study of a child with SMD who used body movements, eye contact, smiles, and vocalizations to communicate showed that social interaction was perceived to increase when members of the dyad were facing each other at a closer range, using synchronized movements, and the dyad members' actively moving hands were close together (Dammeyer & Koppe). This study was completed with a familiar adult staff member as well.

Despite the challenges individuals with SMD face regarding communication, it appears that at least some of their interactions are intentional. It also seems that when given support such as proper positioning, socialization may increase. The limited information these studies were able to provide, makes a case for more research regarding socialization and how positioning affects socialization.

Proximity, Positioning, and Environmental Arrangement

Environmental arrangement refers to organizing an area in a way to encourage communication. Carter et al. (2010) noted that of the studies they reviewed, environmental arrangement was minimally used as a support strategy. Different authors use different terms and means for manipulating environments. Some discuss adapting the environment around the student to make it language rich, providing more access to SGDs, making sure the SGD is positioned properly for the most effective and efficient use, making sure adults without disabilities are not a physical barrier to communication, and pairing appropriate communication partners (Arthur, Bochner, & Butterfield, 1999; Causton-Theoharis & Malmgren, 2005b; Chung & Carter, 2013; McEwen & Lloyd, 1990).

Other authors discussed positioning and proximity, which, for the purpose of this study are also considered part of the environmental arrangement. McEwen and Karlan (1989) positioned students in different adaptive positioning equipment in order to improve their access to AAC, while Girolametto and Weitzman (2007) suggested positioning students face-to-face for the best interactions. To confirm these points, the literature review by Hostyn and Maes (2009) noted that the body position of an individual with SMD-CCN and the availability of SGDs were positively influential on interaction.

Finally, proximity to a SGD as well as proximity to peers (3 ft) in conjunction with other variables such as paraprofessional training and peer training was related to increased interactions (Chung & Carter, 2013) and was essential for developing friendships (Stainback, Stainback, & Wilkinson, 1992). Particularly, 58.6% of peer interactions took place when students with disabilities were near peers without disabilities, and 43.2% of social interactions occurred when they were given access to their SGDs (Chung, Carter, & Sisco). Due to the high number of interactions with peers when in proximity to participants and use of SGD when in proximity to participants, this study showed how both are important for the social interactions of individuals with disabilities.

In these studies, positioning was not the only support used to increase social interaction. Because of this, we were unable to make a conclusion about how positioning alone affects interaction. Consequently, this study investigated the effect of proper positioning on social interactions through nonsymbolic and symbolic communication of adults with SMD-CCN. Proper positioning in this study was specific to the positions individuals with disabilities were in when they were out of their wheelchairs. Participants

were positioned facing peers who also had disabilities, were no more than 3 ft apart, and had access to SGDs.

Chapter Summary

There are many proven interventions for improving the CC of individuals with SMD-CCN and increasing their interactions. When referring to these interventions or the communication of this population in general, the current literature details mainly the interactions between students and adults with SMD-CCN and their support staff. Additionally, the current literature is sparsely populated with information about how to position individuals with SMD-CCN for the most effective communication, especially for the purpose of communicating with other individuals with SMD-CCN. The rationale for this literature review was to identify the gaps in the literature related to interventions and environmental arrangements that encourage people with SMD-CCN to communicate. The gaps identified include the lack of information on how positioning alone influences social interaction and how peers with disabilities communicate with one another. This study begins to fill that gap.

CHAPTER III
RESEARCH METHODS

The Study

Design

For this study, I used a multiple probe design (Gast, 2010) across dyads (or groups of two individuals) with a maintenance condition following the final social positioning with training condition. All of the participants were divided into two groups of three dyads. I chose dyads based on individuals in the same classroom who met the inclusion criteria. Staff members also provided input regarding which individuals might enjoy socializing with one another. The order of conditions included: baseline, social positioning (staff orientation occurred at the onset of social positioning, but was not a condition of its own), social positioning with participant training, and maintenance for all dyads. All dyads began the study simultaneously in baseline. The first and fourth dyads began social positioning after the data points for SGD activations were stable or decelerating (i.e., contratherapeutic) during baseline. The dyads then moved to the condition of social positioning with participant training after there were at least five data points for SGD activations. They moved into this next condition if SGD data was decelerating or after five sessions to determine if data points would further increase with training. The second and fifth dyads began the social positioning condition after the first and fourth dyads started to receive social positioning with participant training and after there were at least five data points for SGD activations. The third and sixth dyads

followed this same staggering of introduction of social positioning. There was some overlap in tiers during later sessions due to time constraints. Following the social positioning with participant training, I gathered maintenance data every other week until the end of the study. There were 12 participants at the beginning of the study, but due to unforeseen events, the study concluded with 10 participants. This design had strong internal validity due to attempts to control for several threats. Table 5 shows the threats to internal validity and how this design attempted to control them.

Table 5

Threats to Internal Validity and How They were Controlled

History	<ul style="list-style-type: none"> • Concurrent baseline and treatment conditions of two dyads at a time
Maturation	<ul style="list-style-type: none"> • Study conducted over a short time period (five months)
Data Instability	<ul style="list-style-type: none"> • Conditions did not change until data stability was present (baseline only)
Attrition	<ul style="list-style-type: none"> • Four or more participants in the study
Instrumentation	<ul style="list-style-type: none"> • Cameras were tested regularly • Scholarly peers of the researcher reviewed the data recording sheet • At least 90% IOA
Adaptation	<ul style="list-style-type: none"> • Camera and SGD placement near participants prior to study initiation (decreased novelty) • Being near a peer was not novel • Used familiar SGDs • Researcher spent more time near participants (decreased novelty)
Testing	<ul style="list-style-type: none"> • Verbal praise offered throughout all conditions

I addressed external validity by demonstrating a functional relation replicated across dyads to increase the generality of findings (Gast, 2010). I visually analyzed data for stability, level, trend, and overlap. If more than one participant showed an abrupt change in trend and level of data, generalization was assumed. An abrupt change for this

population consisted of an increase of at least three occurrences of a target behavior within or between conditions. This design was effective in answering all of the research questions posed previously.

Participants

A convenient sample of 107 potential adult participants with SMD-CCN at a developmental training facility for adults with developmental disabilities provided the participants for this study. Following IRB approval, I compared potential participants to inclusion and exclusion criteria described below. The sample of candidates that remained was eligible for study participation and was screened to determine if they could perform the required nonsymbolic and symbolic communications. The remaining participants took part in the study following legal guardian approval. Ten adults with SMD-CCN participated in the study, resulting in six dyads (two nonparticipants replaced the two participants who withdrew). All of the participants received pseudonyms prior to any data collection. See Appendix A for participants' characteristics listed by pseudonym. In addition to data collected on the target behaviors, I collected data on (a) the time of day and length of time the participants were out of their wheelchairs; (b) activities that occurred and others in the room when they were out of their wheelchairs; (c) participant age, gender, race, ethnicity, and diagnoses; (d) developmental information; (e) communication or SGD goals; (f) SGDs used and length of SGD use; (g) skills related to SGD use; and (h) other goals.

Participants in this study received speech-language pathology services on a consultative basis as needed throughout the year and had knowledge of or exposure to SGDs through recent (in the last 3 years) speech goals completed two to three times

weekly and informally through their developmental training placement. Goals for SGD use focused on initiation, response, or both. Each goal was accompanied by a procedure to teach the individual how to use the SGD.

Inclusion criteria. Potential participants had to have an attendance rate of 90% or greater at the developmental training program for the 6 months preceding the study. All of the participants were 18 years of age or older by the time of recruitment. Each participant had a diagnosis of severe or profound intellectual disability per his or her medical chart as determined by IQ scores. All participants used wheelchairs for mobility and had active and purposeful upper extremity movement to be able to reach toward an object in front of them. Each participant demonstrated the ability to reach toward an object when screened by the speech-language pathologist (SLP). All participants had a need and an ability to activate a SGD (e.g., *LITTLEmack*[™], *LITTLE Step by Step*[™], *Cheap Talk 8*[™]) by any means (e.g., hand, head, eyebrow, lip movement) on command in at least 75% of trials during the screening process, used eye gaze to a person within 3 ft in at least 75% of trials during the screening process, were nonverbal but able to vocalize, and had a history of SGD use (demonstrated operational competence) according to the last 3 years of annual speech-pathology reports. All participants activated SGDs spontaneously and on command with no more than minimal verbal cues depending on the participant.

Exclusion criteria. Participants were excluded who had not had a goal to use a SGD in the last 3 years. Participants were also excluded if they had any medical precautions regarding upper extremity movement, SGD use, or time out of their wheelchairs. Blindness or deafness as a diagnosis were grounds for exclusion as

behaviors measured in this study included eye gaze directed toward a peer and responding to speech or vocalization. Participants were excluded if they were unable to demonstrate any the target behaviors.

Screening to Pinpoint Target Behaviors for Communication

I was the researcher and licensed and certified speech-language pathologist for the participants in this study. I screened each participant to determine which SGD was the most efficient and effective for the participant to activate and if each participant could reach toward an object in front of them using the form in Appendix B. The selected “best” SGD was accessible to the participant in every session throughout the study. I chose SGDs to express symbolic communication as natural speech was challenging for the participants and also because they were familiar with SGDs. The specific SGDs that I chose for each participant were SGDs that were common in the developmental training center. Some SGDs belonged to the developmental training center and some were purchased for the study. I screened the participants on their ability to demonstrate the three nonsymbolic communicative behaviors (eye gaze, vocalization, and reaching) using the form in Appendix B as they were commonly used by the participants to communicate.

Furthermore, a licensed physical therapist (PT) or physical therapist assistant (PTA) and I screened the participants together for the most efficient and effective out-of-wheelchair position that promoted all of the target behaviors for each participant. Each participant had the same position during social positioning, social positioning with training, and maintenance (e.g., sidelying, prone over a wedge) to eliminate a confounding variable of being in various positions during intervention. This was also important because not all positions are conducive to activating a SGD or demonstrating

any of the other target behaviors (McEwen & Lloyd, 1990). The positioning screening form can be found in Appendix C. Some participants had slightly different positions in baseline than in intervention (sitting in beanbag versus sidelying on a wedge) because staff members were not yet trained in baseline; however, participants were still able to complete all of the target behaviors in baseline (e.g., eye gaze, vocalization, reaching for an object in front of them, activating a SGD). They may have been able to demonstrate the target behaviors with a staff member, but not necessarily with their partner. The participants' positions were slightly changed for intervention if the baseline condition position made it difficult for them to demonstrate any of the target behaviors with the selected partner when in social positioning (e.g., if one partner is sidelying on a wedge and a peer is on a bean bag chair, the peer would be sitting too high up to be able to eye gaze or reach to that partner when in proximity).

Staff Participants

Staff participants included 20 staff members at the developmental training center. They ranged in age from 20 to over 40 and were all certified nursing assistants with the exception of one developmental instructor. The staff participants were Hispanic (n=7), Caucasian (n=12), and Asian (n=1). There were 17 female participants and 3 male participants. The years of employment for the participants ranged from less than one year to over 10 years. Staff participants did not work with more than one participant with SMD-CCN during this study.

Setting

This study took place at a developmental training facility for adults with SMD-CCN in a suburban, Midwestern town. The facility included seven classrooms. Each

classroom contained up to 18 adults with SMD-CCN, 3 certified nursing assistants (when fully staffed), and a developmental instructor. It was not a requirement of the facility that the developmental instructor have a teaching certificate. The developmental instructor and assistants occupied various locations in the classroom throughout the day. All of the classrooms contained a variety of positioning equipment for the participants to use when they were out of their wheelchairs (e.g., wedges, mats, gait trainers, standers). The daily routines of the classrooms were individualized for clients of each classroom to be able to participate in a variety of activities as there were often groups they could attend (e.g., music, money skills, aquatic therapy, community outings). Routines also included time for activities of daily living (grooming, toileting, eating) and repositioning out-of-wheelchairs. The staff members individualized time spent out-of-wheelchair for each individual based on physical needs and doctor's orders. Staff members repositioned the clients once per developmental training day for as little as 30 min and as much as 3 hours based on doctor's orders. During out-of-wheelchair time, individuals participated in a variety of individualized activities, such as listening to music, playing an instrument, playing with toys, having gastrostomy tube feedings, curriculum activities (basic concepts, weather, days of the week, etc.) while individuals who remained in their wheelchairs in the classroom participated in group activities (e.g., arts and crafts, listening to a story, playing a game, curriculum activities) or similar individual activities to those out of their wheelchairs. The study took place in the corresponding classroom(s) of the 6 dyads.

During all conditions of the study, each participant was in a dyad with another participant or nonparticipant who remained the same throughout the study. Dyads were

members of the same classroom due to familiarity with each other and for ease of videotaping. There was one dyad per room for rooms C, D, E, and F. Room A had two dyads. Rooms B and G had no participants in this study. Dyad partners were chosen based on my knowledge of the participants as well as staff suggestions regarding which participants might like to be partners. Dyad members faced one another and were no more than 3 ft apart, similar to the distance used in the Chung and Carter (2013) study of peer interactions and proximity, after they completed baseline. Both members of the dyad had a history of SGD use and used an individual SGD or a switch linked to a SGD for the study. Each participant used the same SGD with the same programmed messages throughout the study. Video cameras were located near the dyad where all of the target behaviors of the participants could be captured. Each classroom's staff members supervised nonparticipants completing the activities of their daily routines while I supervised the participants and any nonparticipant partners.

Materials and Equipment

Each participant had his or her appropriate positioning equipment and SGD (see Appendix C). I used event recording as described by Gast (2010) to tally the number of times each participant looked in the direction of a peer (eye gaze), vocalized with a peer present, reached toward a peer, or activated a SGD. I recorded these data along with contextual information on the data recording form that can be found in Appendix D. Other materials used for this study included a Canon Powershot G12 10.0 digital camera for video recording, a Sony Cybershot DSC-T5 digital camera for video recording, and four Nikon Coolpix S3700 digital cameras for video recording. I observed the videos from the study at the end of the day in Windows Media Player and used the timer that

was included in the program to determine the 30 s intervals for ease of interobserver agreement (IOA) data. I measured the distance between dyad members (head-to-head) with a standard tape measure.

Dependent Variables and Data Recording Procedures

Dependent variables. The dependent variables in this study included nonsymbolic communication (eye gaze, vocalization, and reaching) and symbolic communication (SGD activation). Intentional SGD activation was also measured as a dependent variable. Table 6 lists the dependent variables of eye gaze, vocalization, reaching, SGD activation, intentional SGD activation, and definitions for being recorded.

Table 6

Dependent Variables and Recording Definitions

Eye Gaze	<ul style="list-style-type: none"> Recorded any time the participant looked in the direction of a dyad partner's face
Vocalization	<ul style="list-style-type: none"> Recorded vocalization as any noise that came from a participant's mouth that occurred when that participant looked at a dyad partner or a vocalization that seemed to be in response to interaction with a dyad partner (within 20 s of the dyad partner using his or her SGD, vocalizing, reaching for, or looking at the partner)
SGD Activation	<ul style="list-style-type: none"> Recorded when the participant activated his or her SGD or a switch connected to the SGD which caused the SGD to "speak" a message (intentional and unintentional activations combined).
Reaching	<ul style="list-style-type: none"> Recorded when a participant extended his or her upper extremity out in the direction of a peer.
Intentional SGD Activation	<ul style="list-style-type: none"> Intentionality of SGD activation was recorded when that participant activated the SGD in response to interaction with a dyad partner (within 20 s of the dyad partner using his or her SGD, vocalizing, reaching for, or looking at the partner) or when the participant activated the SGD 20s before or after looking at, vocalizing to, or eye gazing to a dyad partner. All SGD activations were recorded and were then coded as intentional if they met the criteria.

Data recording procedures. The dependent variable definitions were adapted from Chung and Carter's (2013) article as they observed verbal and nonverbal initiations and responses, which were similar to the symbolic and nonsymbolic initiations and responses observed in this study. Further, they recorded SGD activation, facial expression, gestures, and vocalizations among other communicative attempts, which were similar to the dependent variables of this study.

I used an event recording system for this study to tally each instance of eye gaze, vocalization, reaching, and SGD activation as suggested by Gast (2010). I recorded these dependent variables in 30 s increments for 20 min during baseline and each treatment condition as well as during the maintenance condition. I took data on the first 20 min the participant was out of his or her wheelchair in all conditions. A similar study about positioning and communication used 30 s increments to collect data and the authors (McEwen, 1992) found this to be an adequate time measurement to indicate a communicative interaction for individuals with profound disabilities. At the beginning of each session, I recorded biographical and contextual information including the participant's name, dyad partner's name, date, time, condition, the session number, distance from dyad partner (head-to-head), the SGD and its message, activity the participant was a part of, the activity of others in the room, who was present in the room, and praise and/or feedback given. I further made a sketch of the participant's position in relation to his or her dyad partner and SGD on the data recording form.

Procedures

The order of conditions included: baseline, social positioning (staff orientation occurred at the onset of to social positioning), social positioning with participant training,

and maintenance. I videotaped the communication between adult peers with SMD-CCN during all conditions. Video cameras placed near the participants captured their communicative attempts. Data collection took place for 20 min sometime between 9:30 a.m. and 11:30 a.m. when the participants were first repositioned out of their wheelchairs Monday through Friday at the developmental training center. Social positioning occurred as many days as my schedule allowed, which was often 4 days per week. Participants received noncontingent verbal praise (e.g., “You’re doing great!”) intermittently for communicating with a peer throughout each condition as intermittent praise for any positive behavior was common at the developmental training center. During the participant training condition, I provided participants with contingent verbal praise and feedback to participants related to the target behaviors (e.g., “Great job pushing your switch [participant name], don’t forget that if you look at [partner name] she will know you are talking to her”) until the end of the study. At the end of the day, I reviewed the videos and collected data on the number of times each participant directed his or her eye gaze toward a dyad partner, vocalized to a dyad partner, reached for a dyad partner, activated a SGD or a switch connected to a SGD, communicated intentionally with his or her SGD, or was verbally praised and/or given feedback by myself or the staff.

Baseline procedures. The purpose of the baseline procedure was to determine how often each participant demonstrated each of the target behaviors when positioned out of his or her wheelchair. When the participants were out of their wheelchairs during baseline, they were typically positioned in or on positioning equipment, such as wedges on the floor or on risers, mats on the floor, standers, gait trainers, Bouncing Chairs™, and bean bags on the floor or on risers with a SGD present. Staff members laid the

participants down near the wall wherever possible around the room often facing the ceiling or the opposite direction of someone next to them, too far to reach, with objects blocking their view of others (e.g., furniture, positioning equipment), and with access to SGDs. Some classmates who did not participate in the study were repositioned out of their wheelchairs during this time as well and some were not. If they were still in their wheelchairs, they participated in group activities with staff members or went to groups outside of the classroom. If they were repositioned out of their wheelchairs, they participated in individual activities with staff members or relaxed. After the participants were positioned in their typical positions (still able to access to demonstrate the target behaviors), I oriented each participant to his or her partner by telling each participant who his or her partner was and also by pointing to that partner. I further oriented each participant to his or her SGD. I showed the SGD to the participant and activated the SGD one time to provide a model for the participant to orient him or her as well as to confirm that the SGD was functional. This was not the first time the participant had seen the SGD, but for consistency, I oriented each participant to each SGD at the beginning of every session. The SGDs had the same messages programmed throughout the study (see Appendix C). See Figure 1 for an example of a room layout during baseline conditions. I collected baseline data for each participant in whatever position or type of positioning equipment the staff positioned him or her in or on at least three times or until data were stable or decelerating. The positions the participants were in during baseline were adequate for relaxation and demonstrating the target behaviors, but were not always the same (e.g. bean bag chair one day and sidelying on a wedge the next facing away from partner, too far to reach, obstructed view, unable to make eye contact with partner).

Positions were not always conducive to communicating with their partners during this condition as staff members were not yet trained at this time. Each baseline probe was 20 min in duration at the beginning of repositioning time. I, as well as staff members, provided noncontingent verbal praise intermittently for communicative behaviors directed at dyad partners (e.g., “You’re doing great”). See Appendix E for a task analysis of baseline procedures.

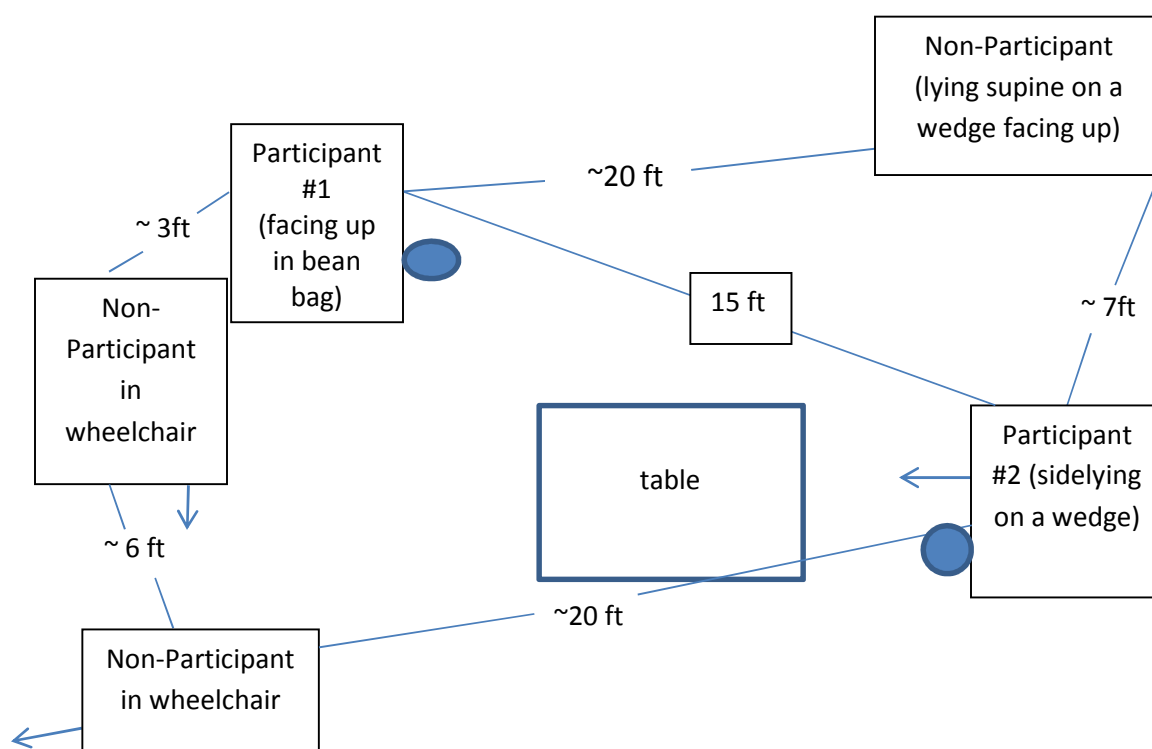


Figure 1. Example of Room Arrangements during Baseline Positioning Conditions

Note. Arrows indicate the direction each individual faced, solid lines represent distances between individuals shown in feet, and blue circles signify SGDs. Staff members are not pictured as they moved around often.

Staff orientation. Prior to the study, I obtained staff member permission to participate in the study and to be videotaped. In addition, similar to Chung and Carter

(2013), I consulted the staff members regarding the message on each SGD to determine what would be the most motivational message (e.g., “Hi”, “Look at me!”, “Let’s chat!”) and also to increase staff appreciation of socialization while out-of-wheelchair. I developed a checklist of how to position individuals with SMD-CCN when out of their wheelchairs for staff members to use after the conclusion of the study as well as a handout describing social positioning (Appendix F). At the onset of the social positioning condition, I completed staff orientation to promote the understanding of social positioning to staff members who worked in the same classroom as the study participants. Appendix G is the staff orientation fidelity checklist that I used with every staff member training. The training consisted of scripted, spoken instructions as well as a demonstration of positioning and how to use the participant’s SGD. I provided an opportunity for a return demonstration of SGD use if the staff member was not familiar with how to use SGDs. I trained staff members in small groups or individually from a scripted training for consistency (Appendix H). During training, staff members learned that they could assist participants in social communication by positioning the participants (a) within 3 ft of one another, (b) facing each other, and (c) providing SGDs with social messages. They also learned the specific SGD, messages, and social positions that the participant they cared for used. Staff members who participated in the study were trained in one session for approximately 5 min in the classroom of the dyad in which they were working. They were expected to help the participants maintain their social positions and help ensure that SGDs remained in the same position which they were able to do following the training.

Social positioning. The independent variable of social positioning was operationally defined as a study participant (when out of his or her wheelchair) positioned facing another participant in a dyad, no more than 3 ft from one another, and provided a SGD. Participants were positioned in this way when they were out of their wheelchairs. The PT or PTA and I predetermined the position that we felt encouraged the most communication (e.g., prone or sidelying). See Figure 2 for an example of a room layout during the optimal positioning conditions.

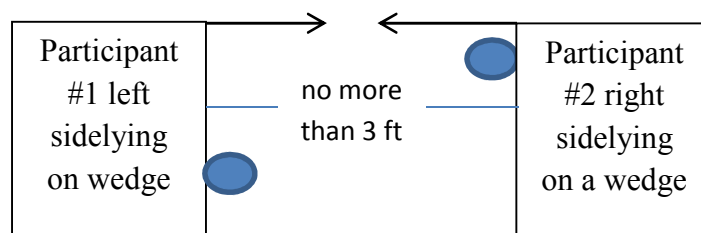


Figure 2. Example of a Dyad Arrangement during Social Positioning Conditions

Note. Arrows indicate the direction each individual faced, solid lines represent distances between individuals shown in feet, and blue circles signify SGDs.

On recording days after the participants were positioned in the positions that promoted the most partner communication, I oriented each participant to his or her partner and SGD. I provided a one-time model for each participant as well as to confirm that the SGD was functional. Participants were video recorded for the first 20 min they were out of their wheelchairs similar to baseline procedures. Noncontingent verbal praise was given by myself and staff members during this condition when participants achieved the target behaviors. The criterion for the conclusion of this condition was the completion of at least five sessions. Participants moved into the next condition if there was a deceleration in SGD activations, but after five sessions, it was possible for

participants to move to the next condition even without decelerating data so as to determine if SGD activation data would improve with training. See Appendix I for a task analysis of social positioning procedures.

Social positioning with participant training procedures. After participant dyads completed at least five sessions in the social positioning condition, they moved into the social positioning with participant training condition. Participants were positioned in the same manner that they were positioned in the previous condition of social positioning. After the participants were properly positioned, I oriented each participant to his or her partner and SGD and activated the SGD one time to provide a model for the participant as well as to confirm that the SGD was functional. Next, I read a simple script to the participants describing how they can communicate when they are near each other by reaching for one another, looking at each other, vocalizing to each other, and activating SGDs. I then provided a modified Aided Language Stimulation lesson where I pointed to each SGD and discussed their messages with each participant and how they could use them. I cued and facilitated each participant to practice reaching, eye gaze, vocalization, and SGD activation to assist with participant understanding as needed. Each participant demonstrated each of the target behaviors with me during this training multiple times during the training condition, but not every participant every day. On the days they did not demonstrate the target behaviors as requested, I first provided verbal cues, then physical prompts as needed (See Appendix J for the script). Modeling of each target behavior was provided at each training session. Immediately after training, I video recorded participants engaging in the target behaviors for 20 min when they were first repositioned out of their wheelchairs. Noncontingent verbal praise was given

intermittently during this condition when participants achieved the target behaviors. The criterion for the completion of this condition was the completion of at least five sessions. During this condition, I added intermittent and contingent verbal praise and feedback directed at specific behaviors in which the participants were engaging for the remainder of the study. This was added to try and further increase the number of target behaviors. The contingent verbal praise and feedback was added in the last session of training for John and Kevin, the fifth session for Calvin and Betty, the second session for Elise, Dulcie, and Faith, and the first session for Irene, Hannah, and Adah. This was similar to the method used by Chung and Carter (2013) to emphasize the target behaviors (e.g., “I like how you pushed your SGD and then looked at John. Now he knows you’re talking to him”). It was often used in this study to emphasize intentionality in particular. Understanding was assumed as data points increased for one or more behaviors following the initial addition of the contingent verbal praise and feedback for all participants except Hannah. (See Appendix I for a task analysis of social positioning with participant training procedures.)

Maintenance procedures. Following the social positioning with training condition, I conducted maintenance probes. I conducted them in the same way in which I conducted social positioning with training probes, but collected data only once every other week following the last social positioning with training session. This condition allowed me to observe any carryover of communicative skills by the participants. See Appendix I for a task analysis of maintenance condition procedures.

Data Analysis Procedures

I analyzed the data visually, which is the most common type of “practical and reliable” analysis in single subject research studies such as this one (Gast, 2010, p. 200). This method was appropriate for this study as I was interested in (a) performance data for individual participants, (b) repeated data collection, (c) making decisions throughout the study based on the visual representation of the data, (d) my ability to see patterns in each participant’s data, and (e) my observation of any secondary findings that occurred (Gast). I analyzed the descriptive statistics of the data (e.g., mean, median, and range), the level trend, and variability of the data between and within conditions, and the percentage of nonoverlapping data (PND). A change in level was noted as an increase or decrease of three data points. I took into consideration all of these measures when determining a functional relation.

Reliability

Dependent measures reliability. I was the data collector and certified and licensed SLP in this study. I collected data during all conditions on all of the target behaviors. I trained a CITI trained peer on how to collect data on the target behaviors from the videos to be my rater. She collected IOA data by viewing the videotapes of 20% of the sessions from each condition (dependent measures reliability). She compared the number of times I tallied each behavior on my data sheets to the videos and noted agreement or disagreement. If a disagreement was noted, the videos were watched again until we came to an agreement. The objective was to achieve 90% IOA for each target behavior. I calculated the mean IOA by dividing the number of total agreements from all conditions by the number of total agreements plus total disagreements from all conditions

and multiplying by 100.

Procedural fidelity. Procedural fidelity data were collected in 20% of each condition. Prior to videotaping the participants, I took a video recording of the room to show the arrangement of the participants, greetings, their SGDs, and how I oriented them to each other and their SGDs. I also completed the procedure of each condition using a procedural checklist (self-recording) which included more steps than I was able to videotape. The same trained rater viewed 20% of the videos of the room from each condition for procedural reliability and reviewed 20% of the associated procedural checklists for completeness. Participant training fidelity was included in this calculation for the social positioning with training condition as the training script was part of the task analysis checklist. I calculated mean procedural reliability by dividing the number of observed researcher behaviors by the number of opportunities to emit the behavior and multiplying by 100 (Billingsley, White, & Munson, 1980). I reported the procedural reliability across all conditions for each participant.

Staff orientation fidelity. Staff orientation was completed using self-recording. I used a checklist (see Appendix G) to train all staff member participants in a consistent manner. The same rater reviewed these checklists for completeness.

Social Validity

I collected social validity data from participating staff members with their permission at the beginning and conclusion of the study to assess the study's goals, procedures, and outcomes. Following the baseline condition, I had staff members complete a pre-intervention survey (see Appendix K) in order to identify their perspectives about social positioning and SGDs for individuals with SMD-CCN. Staff

members completed a post-intervention survey (Appendix K) when their associated dyads completed all of the conditions. The purpose of the survey was to determine if staff members' perceptions of social positioning changed between the beginning and end of the study. The specific suggestions from the articles listed in Table 7 shaped the design of the social validity survey.

Table 7

Suggestions for Creating a Social Validity Questionnaire

-
- Request demographic information first
 - Use a font that is easy to read (Arial 10 or 12 point, for example)
 - Use bold lines to direct the attention of the respondent (Burns et al., 2008)
 - Avoid long questionnaires
 - Use a 5- or 7-point scale with obvious middle points
 - Use an equal combination of regular and reversed items, disperse them throughout, and notify respondents where those reversed items are located
 - Make questions easy to understand
 - Avoid extreme modifiers such as the word *very* (Weijters & Baumgartner, 2012)
 - Use means to report data
 - Use the review of literature to identify the themes of the questionnaire (Pittenger et al., 2014)
-

I gathered information on social validity through staff members' responses to the two identical questionnaires that included demographic questions, questions using a Likert-type scale, and well as open-ended questions. One paper copy was given prior to the intervention and a survey (also a paper copy) was given after the social positioning with training intervention to the same staff members. I reported data from the questionnaire by calculating the mean of the Likert-type questions and by summarizing responses to the open-ended questions.

CHAPTER IV

RESULTS

The purpose of this study was to explore the communication between adult peers with SMD-CCN when they were out of their wheelchairs and provided SGDs, positioning, and proximity to facilitate social communication. The multiple probe design was selected as the best way to determine if a functional relation between the intervention of social positioning (or social positioning with participant training) and the adults' nonsymbolic and symbolic communicative behaviors existed. This study consisted of four conditions including baseline, social positioning (staff orientation was completed at the onset of social positioning), social positioning with participant training, and maintenance. This study also served to evaluate participant communication carryover through maintenance data collection and to measure staff interest through social validity surveys. The sections that follow include the data and data analysis for reliability measures, dependent variable measures, and social validity results. These sections provide the answers to the following research questions posed previously:

1. Will social positioning increase the nonsymbolic communication of eye gaze, vocalization, and reaching of adults with SMD-CCN?
2. Will social positioning increase the symbolic communication of SGD activation of adults with SMD-CCN?
3. Will social positioning increase the intentionality of SGD activation?

4. Will social positioning with participant training further increase the nonsymbolic and symbolic communication and intentionality of adults with SMD-CCN?
5. Will symbolic and nonsymbolic communication be maintained by adults with SMD-CCN?
6. Will staff members' perceptions of positioning change between the beginning and end of the study?

Inter-observer Reliability

Inter-observer reliability was collected for at least 20% of the sessions in each of the four conditions of the study. Inter-observer agreement (IOA) was calculated using the point-by-point method by dividing the number of agreements by the number of agreements plus disagreements and multiplying by 100 (Gast, 2010). IOA compared the author's data with the rater's data for each occurrence of the target behaviors and intentionality of SGD activations within each 30 s interval of the videotaped session. IOA was 100% for all participants in all conditions. If a disagreement was noted, the video was watched again in order for both parties to come to an agreement.

Procedural Reliability

Procedural reliability was collected for at least 20% of the sessions for each condition based on a task analysis checklist and brief initial video showing the classroom and dyad arrangement. The video showed the entire classroom in baseline and dyad-only arrangements during the remaining conditions. The 20 min video recordings of the adult participants began after the procedural video ended. Reliability was calculated by dividing the number of steps completed by the total number of steps listed on the task

analysis and multiplying by 100. Mean procedural reliability was 99% for baseline, 100% for social positioning, 100% for social positioning with participant training, and 100% for maintenance. During baseline, there was a session in which I failed to thank the participant.

Staff Orientation Fidelity

Procedural reliability for staff orientation was collected in 20% of the staff orientation sessions based on a task analysis checklist. Checklists were completed at the time of videotaping. The rater examined the checklists for completeness. One hundred percent procedural reliability was achieved for the training sessions.

Participant Training Fidelity

Procedural reliability for participant training was incorporated in the task analysis checklist for the social positioning with training condition and was collected in 20% of the sessions based on a task analysis checklist and brief initial video showing the dyad arrangement. Reliability was calculated by dividing the number of steps completed by the total number of steps listed on the task analysis and multiplying by 100. One hundred percent rater agreement was achieved for social positioning with training and maintenance conditions (the only conditions where participant training was completed).

Social Communication Outcomes

There were 10 opportunities during this study to show a demonstration of effect. A functional relation was demonstrated for eye gaze, SGD activations, and intentional SGD activations across all participants when social positioning was introduced. No functional relation was demonstrated for vocalization or for reaching when social positioning was introduced. Although the target behaviors continued to be demonstrated

during social positioning with training, no functional relation was noted for this condition. Most often there was no improvement noted and when there was improvement, it was typically minimal. Figures 3 (data for Calvin, Betty, Faith, Irene, and Hannah) and 4 (data for John, Kevin, Elise, Dulcie, and Adah) show the number of times each behavior was recorded for each participant over the four conditions. Figures 5 and 6 display the intentionality of SGD activation in comparison to the number of times a SGD was activated for each participant. For Figures 3-6, a triangle represents SGD activation, a diamond represents eye gaze, an open circle represents reaching, a square represents vocalization, and an open square represents intentional SGD activations. See Tables 8-17 for data analysis of the mean, median, range, relative and absolute level change, and percent of nonoverlapping data (PND) of each of these behaviors across each participant.

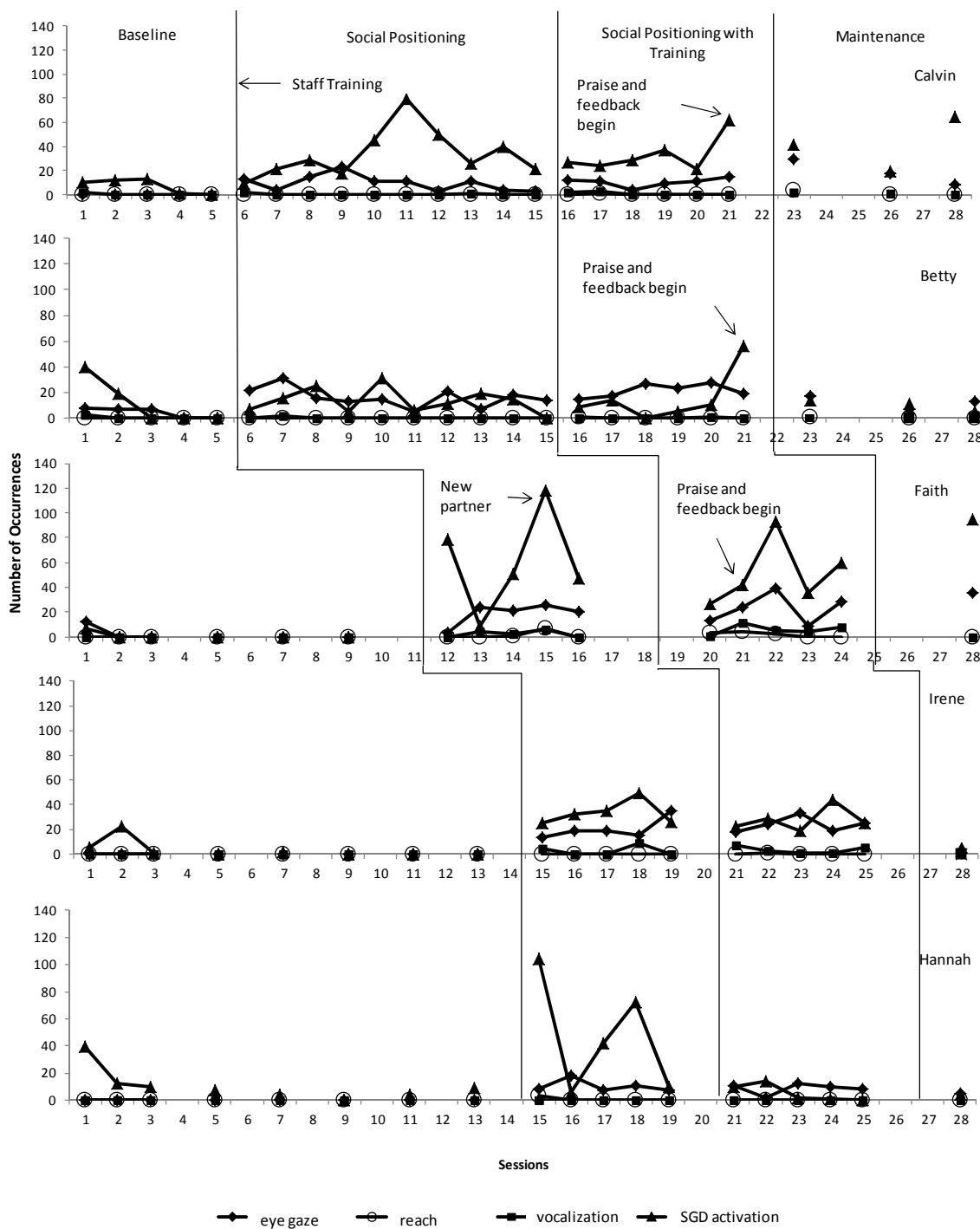


Figure 3. Participant Data (Calvin, Betty, Faith, Irene, Hannah)

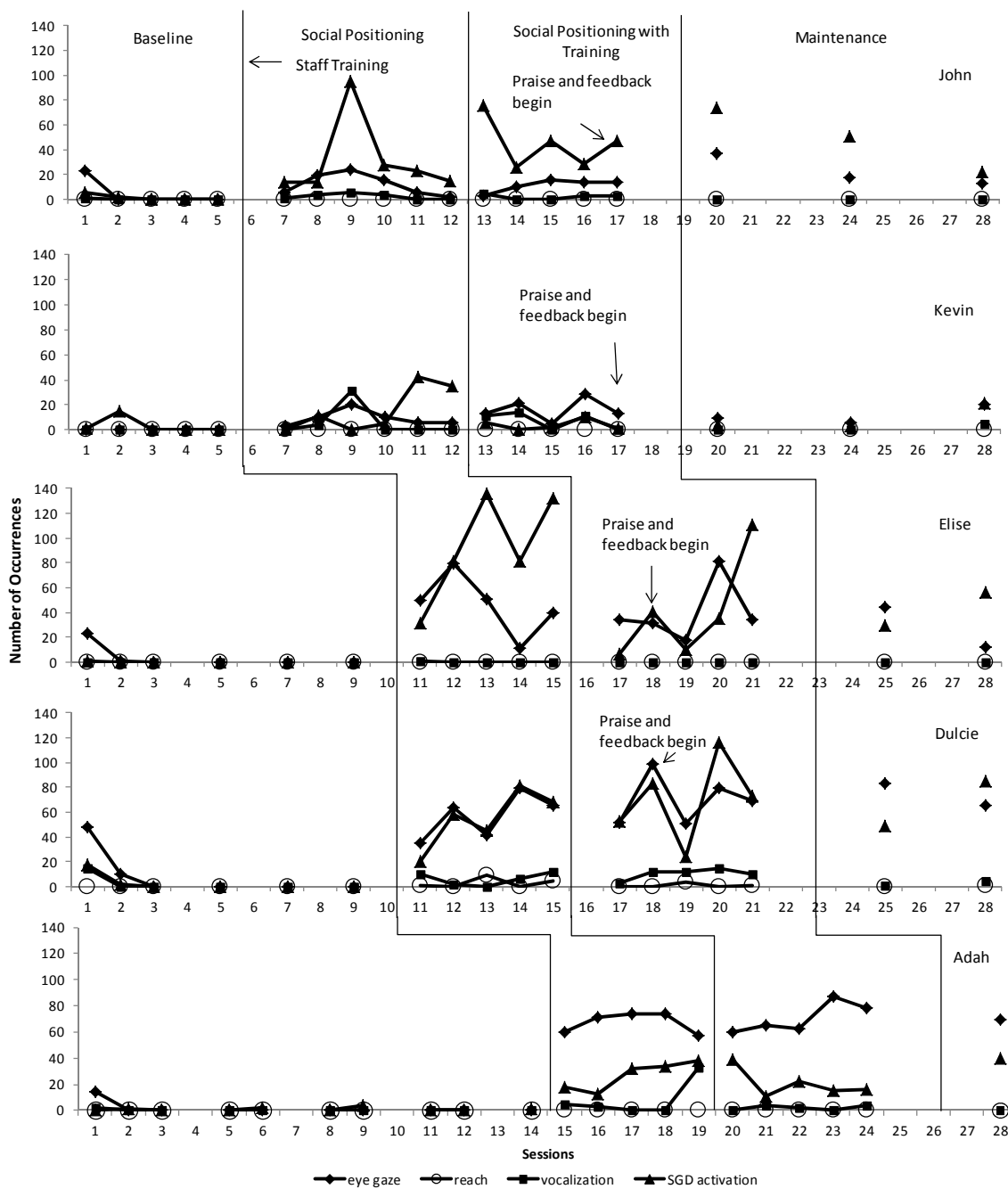


Figure 4. Participant Data (John, Kevin, Elise, Dulcie, Adah)

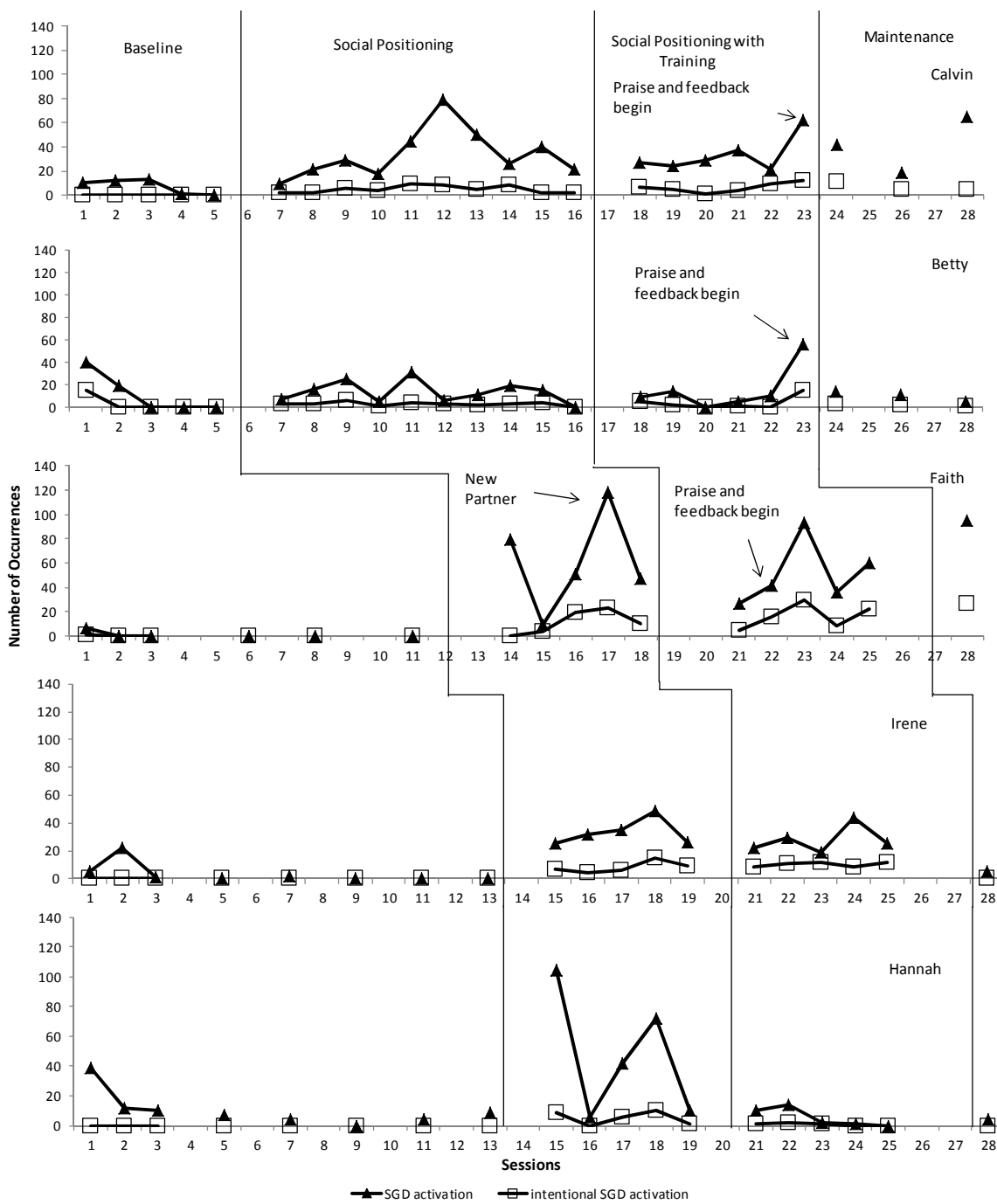


Figure 5. SGD Activation and Intentional SGD Activation (Calvin, Betty, Faith, Irene, Hannah)

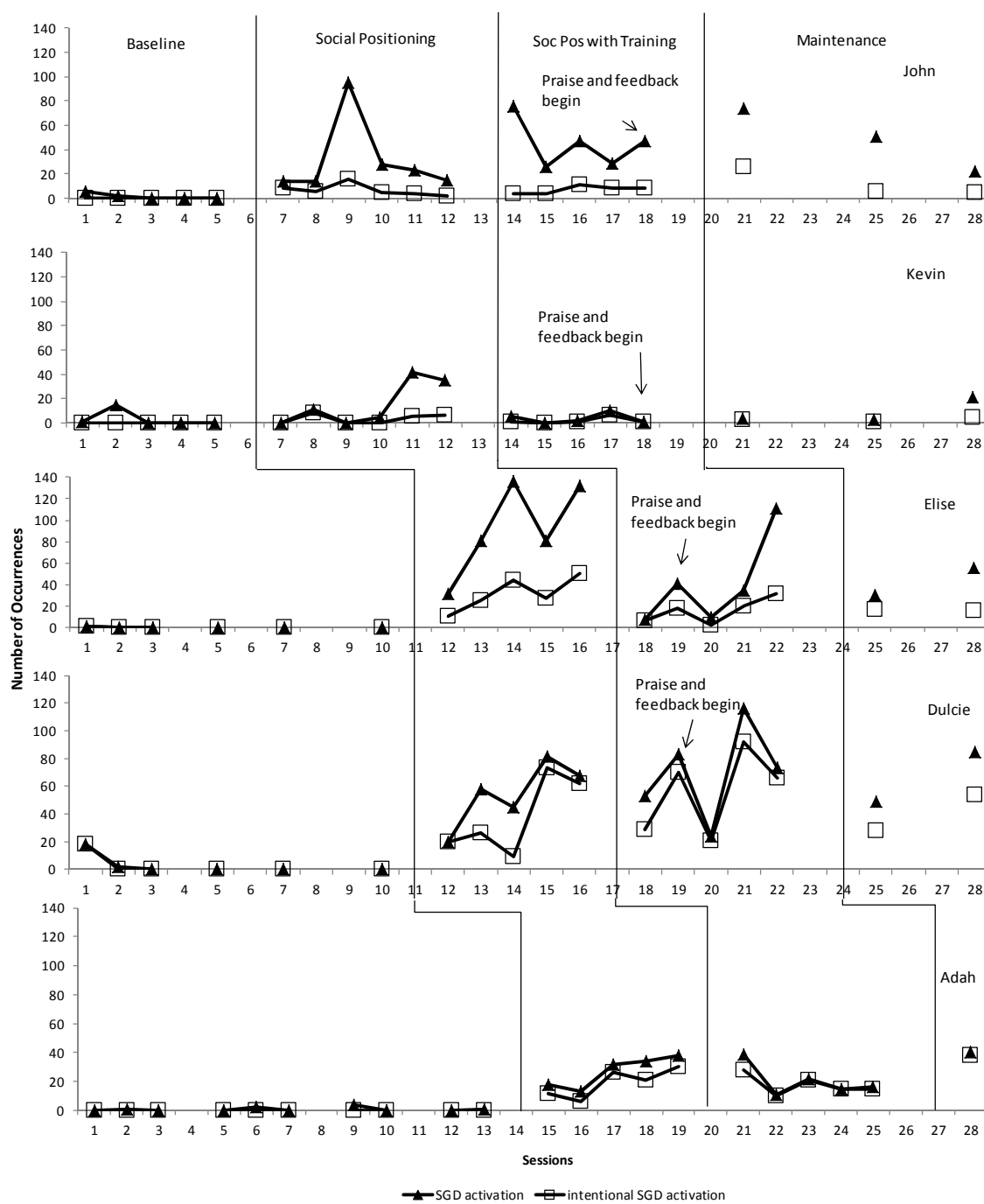


Figure 6. SGD Activation and Intentional SGD Activation (John, Kevin, Elise, Dulcie, Adah)

It was hypothesized that the intervention of social positioning would increase the occurrences of nonsymbolic social-communication behaviors (eye gaze, vocalization,

reaching) as well as symbolic social-communication behaviors (SGD activations including intentional SGD activations). There was a functional relation noted between baseline and social positioning with SGDs for all participants though a weaker demonstration of effect for Betty and Kevin. Eye gaze increased after the introduction of social positioning for all participants illustrating a functional relation though weaker for Kevin. Vocalizations occurred more often by participants in social positioning than in baseline; however, no functional relation could be made. While reaching occurred infrequently for the two participants who chose to reach during the social positioning condition, no functional relation could be determined. There was little change between social positioning and social positioning with participant training in the demonstration of target behaviors; however, 8 out of the 10 participants had slight increases in the mean occurrences of at least one behavior (excluding Elise and Hannah). Maintenance data for social positioning with training were variable. SGD activations increased for 6 of the 10 participants (excluding Hannah, Irene, John, and Betty), eye gaze increased or maintained for 4 of the 10 participants (Kevin, Faith, John, Adah), vocalization increased for 2 of the 10 participants (Kevin and Dulcie), and intentional SGD activations increased or maintained for 5 of the 10 participants (Kevin, Dulcie, Elise, Adah, and Faith). Reaching increased minimally for Calvin and Dulcie in the maintenance condition and remained at zero for the other participants.

Calvin

Calvin's baseline data were stable for all of the target behaviors in the final two sessions, which prompted a move to the social positioning condition. Eye gaze data had an immediate level change, but data were variable and decelerated after peaking at the

fourth session. PND was 100%. Vocalization data started out with two occurrences in session one and deteriorated to zero for all remaining sessions in the condition. Reaching remained at zero during all sessions. SGD activations had an immediate level change and upward trend peaking during the sixth session, and then the trend deteriorated in a contratherapeutic (downward) direction. PND was 90%. These decelerations (particularly SGD activations) prompted me to move Calvin to the social positioning with training condition.

Calvin had an abrupt and therapeutic (upward) level change for eye gaze and SGD activation at the onset of participant training (vocalization by the second session). Data were fairly stable for eye gaze and SGD activation and moved in a therapeutic direction overall. Calvin reached one time during this condition. During the fifth session of this phase, contingent verbal praise with feedback on the specific target behaviors began in an attempt to increase the level of the target behaviors (“I like how you pushed your SGD, if you look at Betty, she’ll know you’re talking to her”). Eye gaze and SGD activation improved abruptly following this session. A slight change was noted in other target behaviors during this condition. After six social positioning sessions, Calvin was moved to the maintenance condition.

At the beginning of the maintenance condition, SGD activation data had an abrupt and contratherapeutic change in level, whereas eye gaze had an abrupt and therapeutic level change. SGD activation data were variable in this condition, but concluded by moving in a therapeutic direction, while eye gaze deteriorated. Vocalization improved minimally during the first two sessions, but decreased thereafter until the end of the study. No reaching was observed. See the graph of Calvin’s target behaviors in Figure 3

and Table 8 for descriptive statistics.

Intentional SGD activations were stable during social positioning and overall therapeutic until the ninth session when the data slightly decelerated (see Figure 5). An abrupt and therapeutic level change for intentional SGD activation was noted at the onset of social positioning with participant training. Data were stable and moved therapeutically overall. During maintenance, intentional SGD activation decreased from the level it had been in the training condition, but stabilized in the final two sessions.

Betty

Betty's baseline data were stable for all of the target behaviors in the final two sessions, which prompted a move to the social positioning condition. In addition, Betty was paired with Calvin and all decisions to move onto the next condition were made based on both individuals. There was an abrupt change in level for eye gaze and SGD activation and eye gaze had 80% PND. Vocalization and reaching were stable near zero for the entirety of the condition. The decelerations of SGD activation and eye gaze in the ninth session incited me to move Betty into the social positioning with training condition.

Betty's data during the social positioning with training condition remained similar to the data during the social positioning condition. During the fifth session of this phase, contingent verbal praise with feedback on the specific target behaviors began in an attempt to increase the level and stability of the target behaviors ("I like how you pushed your SGD, if you look at Calvin, he'll know you're talking to him"). SGD activations showed an abrupt and therapeutic change in level and trend following that session. After six sessions, Betty was moved into maintenance where the data remained consistent. See the graph of Betty's target behaviors in Figure 3 and Table 9 for descriptive statistics.

There was an immediate change in level for intentional SGD activation that decelerated by the last session of the social positioning condition (see Figure 5). Data remained the same during social positioning with training. Intentional SGD activations did show an abrupt and therapeutic change in level following the session where contingent praise and feedback began, however this did not maintain through the end of the study.

Calvin-Betty

Calvin and Betty as a dyad showed similar trends for the target behaviors. Although Calvin had greater magnitude level changes in social positioning and social positioning with training for SGD activation, Betty demonstrated level and trend changes at similar times indicating that communication was taking place. The same was true of intentional SGD activations. In addition, at times when Calvin was activating a SGD more often, Betty's eye gaze increased and vice versa which could indicate that they were giving attention to the more expressive communicator on those days.

Faith

Faith's baseline data were stable for all of the target behaviors prior to moving to the social positioning condition. In the social positioning condition, Faith had an abrupt change in level for SGD activation initially, but this data became highly variable after the second session. Still, PND was 100%. Eye gaze and vocalization showed a delayed effect beginning in the second session and 80% PND. Vocalization showed a small change in level and 60% PND. Reaching remained stable and low throughout this condition. At session four, Faith required a new, non-participant partner. She was told this and was encouraged to choose her own partner which she did by driving her power

wheelchair up to a classmate, pointing at her, smiling, and vocalizing. Faith moved into the social positioning with training condition after five sessions.

During social positioning with training, her data remained similar to the previous condition even with contingent verbal praise and feedback on the target behaviors during the second session. Data maintained during Faith's one maintenance session. See the graph of Faith's target behaviors in Figure 3 and Table 10 for descriptive statistics.

During social positioning, Faith's intentional SGD activation data showed a delayed effect as the first data point was decreased from the previous level (see Figure 5). Data accelerated starting in session two, but there was a slight deceleration by the fifth session. Despite this deceleration, PND was 80%. In social positioning with training, Faith's data remained consistent at the same level as social positioning. In her one maintenance session, her data level maintained from the previous session for intention.

Faith-nonparticipant partner

There were no data collected for the nonparticipant partner in this dyad, so it is difficult to show interaction that they had. However, on the videotapes of this dyad, the partners were observed (only sound for nonparticipant) taking what could be considered conversational turns during intervention (Faith looked at her partner, vocalized, reached, and activated her SGD, and then her partner looked at Faith and occasionally vocalized or activated her SGD). Because Faith had a nonparticipant partner, there is no way to compare the relation across target behaviors between partners. Individually, Faith demonstrated eye gaze, vocalizations, reaching, SGD activations, and intentional SGD activations often when social positioning was introduced.

Irene

Irene's baseline data were stable before moving into social positioning. She had an abrupt improvement in level for eye gaze and SGD activations, but low stable data for vocalization and no change in reaching. Following the initial change, eye gaze accelerated with 100% PND and SGD activations accelerated until the final session at which time it slightly decelerated. Despite this deceleration, PND was 100%. Data for vocalization was low and variable. After five sessions, Irene moved into the social positioning with training condition and contingent verbal praise and feedback where data remained similar. Reaching was demonstrated one time during this condition. In the one maintenance session for Irene, the data deteriorated to near baseline levels. See the graph of Irene's target behaviors in Figure 3 and Table 11 for descriptive statistics.

Irene had an abrupt improvement in level for intentional SGD activations at the onset of social positioning and fluctuated between 4 and 15 for the remainder of the sessions (see Figure 5). While the change in level was small, PND was 100%. Results were similar during the social positioning with training condition and decreased during maintenance.

Hannah

Hannah had a stable baseline for five sessions prior to entering social positioning. In addition, Hannah was paired with Irene and all decisions to move onto the next condition were made based on both individuals. Eye gaze was low and stable throughout the condition. PND for eye gaze was 100% and 60% for SGD activations. For SGD activations during social positioning, there was an abrupt improvement in level initially followed by highly variable data and deceleration at the final session. Vocalizations were

not demonstrated during this condition while reaching decelerated. The deceleration of SGD activations prompted me to move Hannah to social positioning with training.

From the first session of training, contingent verbal praise with feedback on the specific target behaviors began in an attempt to increase the level and stability of the target behaviors (“I like how you pushed your SGD, if you look at Irene, she’ll know you’re talking to her”). In this condition, SGD activations and eye gaze data were low and stable. No reaching or vocalizations were observed during this condition. Hannah was then moved to maintenance. There was one maintenance data point for Hannah that showed a very minimal increase in level for SGD use, but all other behaviors deteriorated. Hannah had increased seizure activity around the time of the study (particularly once intervention began) that was abnormal for her and which may have caused her data to be variable. See the graph of Hannah’s target behaviors in Figure 3 and Table 12 for descriptive statistics.

During social positioning, Hannah’s intentional SGD activations were low and variable, but there was an abrupt change in level (see Figure 5). Data for intentionality decreased further in social positioning with training and Hannah’s data was at zero by the time she reached her one maintenance session.

Irene-Hannah

Similar to Calvin and Betty, Irene and Hannah’s data followed similar trends despite differences in magnitude during intervention. Similarities may have been greater had it not been for the seizure activity Hannah experienced during intervention.

Individually, Irene demonstrated intentional SGD activations during every session of social positioning and social positioning with training.

John

John's data were stable for all of the target behaviors in the final three sessions of baseline which prompted me to move him into the social positioning condition. An abrupt change in level and trend in a therapeutic direction for eye gaze and SGD activations occurred with the introduction of social positioning. Eye gaze SGD activation and vocalization accelerated therapeutically for three sessions before decelerating for the final three sessions. Reaching was never elicited. Despite the deceleration, PND was 100%. This deteriorating trend prompted me to move John into a social positioning with training condition in an attempt to increase the target behaviors.

Eye gaze and vocalization remained relatively stable during training and consistent with the prior condition. An abrupt level change was noted with SGD activation at the onset of the training condition which deteriorated and became variable beginning in the second session through the remainder of the condition. Reaching was never elicited again. During the fifth session of this phase, contingent verbal praise with feedback on the specific target behaviors began in an attempt to increase the level and stability of the target behaviors ("I like how you pushed your SGD, if you look at Kevin, he'll know you're talking to him"). An increase in level in a therapeutic direction was noted in that session for SGD activation. After five sessions, John was then moved to a maintenance condition. John had an abrupt change in level in a therapeutic direction for SGD activation and eye gaze in the first maintenance session, but then these behaviors began to deteriorate for the remainder of the study. Vocalization remained at zero during maintenance and reaching was never demonstrated. See the graph of John's target behaviors in Figure 4 and Table 13 for descriptive statistics.

An abrupt change in level and trend in a therapeutic direction for intentional SGD activations occurred with the introduction of social positioning (see Figure 6). During social positioning, intentional SGD activation accelerated therapeutically for three sessions before decelerating for the final three sessions. Despite the deceleration, PND was 100%. After entering social positioning with training, intentional SGD activation remained relatively stable at the same level as the previous condition. An abrupt change in level in a therapeutic direction for intentional SGD activation was noted in the first maintenance session, but then began to deteriorate for the remainder of the study.

Kevin

Kevin's baseline data were stable for all of the target behaviors in the final three sessions, which prompted a move to the social positioning condition. In addition, Kevin was paired with John and all decisions to move onto the next condition were made based on both individuals. Eye gaze and vocalization showed brief acceleration before decelerating during the fourth session. SGD activation followed an overall variable, therapeutic trend. Despite this variability, PND was 100%. Reaching was never elicited. After six sessions, Kevin moved into social positioning with training.

The onset of the training condition showed abrupt level changes in a therapeutic direction for eye gaze and vocalization and a negative change in level for SGD activation. Reaching was never observed. All behaviors (except reaching) were variable throughout the remainder of the condition and concluded with contratherapeutic data trends. During the fifth session of this phase, contingent verbal praise with feedback on the target behaviors began in an attempt to increase the level and stability of the target behaviors ("I like how you pushed your SGD, if you look at John, he'll know you're talking to him").

After five sessions, Kevin was moved into the maintenance condition. Maintenance data was taken over three sessions and began with a small level change in a contratherapeutic direction from the previous condition for eye gaze, vocalization, and SGD activation. Although data was variable throughout the condition, eye gaze, vocalization, and SGD activation moved in a therapeutic direction by the third session. Kevin did not demonstrate reaching throughout the study. See the graph of Kevin's target behaviors in Figure 4 and Table 14 for descriptive statistics.

Intentional SGD activation was less variable than SGD activation throughout, but followed similar trends to SGD activation and had 100% PND (see Figure 6). Data maintained at the low levels.

John-Kevin

Similar to the other dyads, John and Kevin's data followed relatively similar data paths. However, with this dyad, when a high magnitude change in SGD activation occurred for John, Kevin's SGD activations decreased and vice versa. Individually, Kevin communicated with eye gaze and vocalizations, but John did not demonstrate these behaviors regularly.

Elise

The first data point showed higher levels of eye gaze and SGD activation than the remainder of baseline data because Elise and her partner were coincidentally positioned next to each other on day one of the study. Elise's baseline data were stable for the remaining five sessions for all target behaviors, which incited a change to the social positioning condition. In the social positioning condition, eye gaze data were variable and deteriorating, while SGD data was variable, but moving in a therapeutic direction.

Despite these differences, Elise had an abrupt change in level and trend in a therapeutic direction for SGD activation (80% PND) and eye gaze (100% PND). Vocalizing and reaching were stable at zero in this condition. Elise moved to social positioning with training after five sessions in the previous condition to determine if the target behaviors would further increase.

In social positioning with training, data levels were slightly lower than the previous condition for eye gaze and SGD. During the second session of this condition, contingent verbal praise with feedback on the specific target behaviors began in an attempt to increase the level and stability of the target behaviors (“I like how you pushed your SGD, if you look at Dulcie, she’ll know you’re talking to her”). Data continued to be variable for eye gaze and SGD activation through the remainder of the condition. Vocalization and reaching did not occur. Following five sessions, Elise moved into maintenance. In the maintenance condition, eye gaze started at the same level as the previous condition before deteriorating during the final maintenance session. SGD activation decreased in level from the previous session, but increased back to a previous level before the study was complete. See the graph of Elise’s target behaviors in Figure 4 and Table 15 for descriptive statistics.

Elise had an abrupt change in level and trend in a therapeutic direction and 100% PND for intentional SGD activations during social positioning (see Figure 6). The data level was slightly lower in the social positioning with training condition and no functional relation was demonstrated. Intentional SGD activations further decreased in level during two maintenance sessions, but remained stable.

Dulcie

The first data point showed higher levels of eye gaze and SGD activation than the remainder of baseline because Dulcie and her partner were coincidentally positioned next to each other on day one of the study. The remainder of her baseline data were stable or decelerating prior to moving to social positioning. In addition, Dulcie was paired with Elise, and all decisions to move onto the next condition were made based on both individuals. At the onset of the social positioning condition, there was an abrupt and immediate change in level for eye gaze, vocalization, and SGD activation. Eye gaze continued to move in a therapeutic direction despite some variability throughout the condition. Eye gaze and SGD activations had 80% and 100% PND respectively. Vocalization and reaching were somewhat variable and overall low for the entirety of the condition. After five sessions, the next condition began.

During social positioning with training, data levels remained the same for all of the target behaviors. Following the fifth session, Dulcie was moved to maintenance. Initially, a change in level contratherapeutically was noted for SGD, but not eye gaze. In the second maintenance session, eye gaze decelerated and SGD activation accelerated. No vocalizations or reaching occurred during training or maintenance. See the graph of Dulcie's target behaviors in Figure 4 and Table 16 for descriptive statistics.

At the onset of Dulcie's social positioning condition, there was an abrupt level change with an upward trend until the final session which slightly decelerated for intentional SGD activation (see Figure 6). Intentional SGD activation in this condition had 80% PND. When Dulcie moved to social positioning with training, there was a decrease in level for intentional SGD activation which recovered to continue a

therapeutic trend before deceleration during the final session. During maintenance, a change in level contratherapeutically was noted for intentional SGD activation, but the second maintenance session data accelerated.

Elise-Dulcie

Like other dyads, Elise and Dulcie demonstrated similar patterns of target behavior trends particularly for SGD activations during all conditions. Both participants had a large magnitude level change after the introduction of contingent verbal praise and feedback as well. Individually, Dulcie demonstrated gains in vocalizations and reaching, but Elise's data did not.

Adah

Adah had nine stable baseline sessions before entering social positioning. She was coincidentally able to see her partner during the first baseline session, causing an increase in eye gaze. During social positioning, she demonstrated an abrupt change in level for eye gaze and SGD activations which continued into a stable and therapeutic trend. During the final session of this condition, she had a deceleration in eye gaze and an acceleration in vocalization. PND for eye gaze, vocalization, and SGD activations were 100%, 60%, and 100%, respectively. No reaching was elicited. After five sessions, Adah was moved into social positioning with training to determine if therapeutic data trends would continue.

From the first session of the social positioning with training condition, contingent verbal praise with feedback on the specific target behaviors began in an attempt to increase the level and stability of the target behaviors ("I like how you pushed your SGD, if you look at your partner, he'll know you're talking to him"). Eye gaze data continued

from the previous level and accelerated until the final session in which it decelerated. The final data point still remained higher than all but one data point in the condition. SGD activations decelerated from the previous level. In the one maintenance session, there was very little deterioration of the level of eye gaze from training and the level of SGD activation had a substantial improvement in level. Vocalization increased slightly during this condition, but reaching did not occur. See the graph of Adah's target behaviors in Figure 4 and Table 17 for descriptive statistics.

During social positioning, Adah demonstrated an abrupt change in level for intentional SGD activations which continued into a stable and therapeutic trend and 100% PND (see Figure 6). During social positioning with training, intentional SGD activations decelerated from the previous condition's level. In the one maintenance session, intentional SGD activations had a substantial improvement in level.

Adah-nonparticipant partner

Since there were no data collected for the nonparticipant partner in this dyad, it is difficult to discuss their interactions. However, on the videotapes of this dyad, the partners were observed (only sound for nonparticipant) taking what could be considered conversational turns during intervention (Adah looked at her partner, vocalized, and activated her SGD, and then her partner looked at Adah and vocalized or activated his SGD). This happened frequently for this dyad. Adah had strong data for all of the target behaviors regularly (except reaching) during social positioning.

Table 8

Calvin's Data

Mean (median, range) occurrences				
Target behavior	Baseline	Social Positioning	Training	Maintenance
Eye gaze	0(0, 0-0)	9.8(11, 3-23)	10.3(11, 4-15)	18.7(18, 8-30)
Vocalization	0.4(0,0-2)	0.3(0, 0-2)	0.8(0,0-3)	1 (1, 0-2)
Reaching	0(0, 0-0)	0(0, 0-0)	0.2(0, 0-1)	1.3(0, 0-4)
SGD activation	7.2(10, 0-13)	33.8(27.5, 9-79)	33.8(28, 21-62)	42(42, 19-65)
Intentional SGD	0(0, 0-0)	4.8(3, 0-7)	6.3(6, 1-12)	7(5, 5-11)

Between conditions relative level change		
Target behavior	Baseline to Social Positioning	Social Positioning to Training
Eye gaze	13	7
Vocalization	0	2
Reaching	0	0
SGD activation	20.5	-13
Intentional SGD	4	0

Between conditions absolute level change		
Target behavior	Baseline to Social Positioning	Social Positioning to Training
Eye gaze	13	9
Vocalization	2	2
Reaching	0	0
SGD activation	9	6
Intentional SGD	2	5

PND		
Target behavior	Baseline to Social Positioning	Social Positioning to Training
Eye gaze	100%	0%
Vocalization	0%	17%
Reaching	0%	17%
SGD activation	90%	0%
Intentional SGD	100%	17%

Note. The data displayed includes the mean, median, and range in number of times Calvin completed a target behavior, relative and absolute level changes, and percent of non-overlapping data.

Table 9

Betty's Data

Mean (median, range) occurrences				
Target behavior	Baseline	Social Positioning	Training	Maintenance
Eye gaze	4.4 (7, 0-8)	16.2(3.1, 5-31)	21.5(21, 15-28)	12.3(13, 7-17)
Vocalization	0.6(0,0-3)	0.2(0, 0-2)	0.17(0,0-1)	0.3(0, 0-1)
Reaching	0(0, 0-0)	0(0, 0-0)	0.17(0, 0-1)	0(0, 0-0)
SGD activation	11.8(0, 0-40)	13.5(13, 0-31)	15.7(9.5, 0-56)	10(11, 5-14)
Intentional SGD	0(0, 0-0)	2.9(1.5, 0-6)	3.8(2, 0-15)	2(2, 1-3)

Between conditions relative level change		
Target behavior	Baseline to Social Positioning	Social Positioning to Training
Eye gaze	16	2
Vocalization	0	0
Reaching	0	0.5
SGD activation	16	0.5
Intentional SGD	3	0.5

Between conditions absolute level change		
Target behavior	Baseline to Social Positioning	Social Positioning to Training
Eye gaze	22	1
Vocalization	0	0
Reaching	0	1
SGD activation	7	9
Intentional SGD	3	5

PND		
Target behavior	Baseline to Social Positioning	Social Positioning to Training
Eye gaze	80%	0%
Vocalization	0%	0%
Reaching	0%	17%
SGD activation	0%	17%
Intentional SGD	0%	17%

Note. The data displayed includes the mean, median, and range in number of times Betty completed a target behavior, relative and absolute level changes, and percent of non-overlapping data.

Table 10

Faith's Data

Mean (median, range) occurrences				
Target behavior	Baseline	Social Positioning	Training	Maintenance
Eye gaze	2(0, 0-12)	18.8(21, 3-26)	22.6(24, 9-39)	36(36, 36-36)
Vocalization	0(0, 0-0)	2.8(4, 0-6)	5.8(5,1-11)	0(0, 0-0)
Reaching	0(0, 0-0)	1.6(0, 0-7)	1.8(2, 0-4)	0(0, 0-0)
SGD activation	1.2(0, 0-7)	60.8(51, 9-118)	51.6(42, 27-93)	95(95, 95-95)
Intentional SGD	1.2(0, 0-1)	11.2(2, 0-4)	16.2(16, 5-30)	14(14, 14-14)

Between conditions relative level change		
Target behavior	Baseline to Social Positioning	Social Positioning to Training
Eye gaze	13.5	-4.5
Vocalization	2	3
Reaching	0	0
SGD activation	44	-50
Intentional SGD	2	-6

Between conditions absolute level change		
Target behavior	Baseline to Social Positioning	Social Positioning to Training
Eye gaze	3	-7
Vocalization	0	1
Reaching	0	3
SGD activation	0	-20
Intentional SGD	0	-5

PND		
Target behavior	Baseline to Social Positioning	Social Positioning to Training
Eye gaze	80%	40%
Vocalization	60%	40%
Reaching	40%	0%
SGD activation	100%	0%
Intentional SGD	80%	20%

Note. The data displayed includes the mean, median, and range in number of times Faith completed a target behavior, relative and absolute level changes, and percent of non-overlapping data.

Table 11

Irene's Data

Mean (median, range) occurrences				
Target behavior	Baseline	Social Positioning	Training	Maintenance
Eye gaze	0(0, 0-0)	20.2(19, 13-35)	23.8(24, 18-33)	1(1, 1-1)
Vocalization	0(0, 0-0)	2.6(0, 0-9)	5.2(3,1-7)	0(0, 0-0)
Reaching	0(0, 0-0)	0(0, 0-0)	0.13(0, 0-1)	0(0, 0-0)
SGD activation	3.8(0.5, 0-22)	33.4(32, 25-49)	27.8(25, 19-44)	5(5, 5-5)
Intentional SGD	0(0, 0-0)	4.4(5, 4-15)	10.2(11, 8-12)	0(0, 0-0)

Between conditions relative level change		
Target behavior	Baseline to Social Positioning	Social Positioning to Training
Eye gaze	65.5	-3
Vocalization	0	-14.5
Reaching	0	0
SGD activation	15	-11
Intentional SGD	9	-6.5

Between conditions absolute level change		
Target behavior	Baseline to Social Positioning	Social Positioning to Training
Eye gaze	16	-4
Vocalization	2	0.5
Reaching	0	0.5
SGD activation	28.5	-12
Intentional SGD	5.5	-2.5

PND		
Target behavior	Baseline to Social Positioning	Social Positioning to Training
Eye gaze	100%	0%
Vocalization	40%	0%
Reaching	0%	20%
SGD activation	100%	0%
Intentional SGD	100%	0%

Note. The data displayed includes the mean, median, and range in number of times Irene completed a target behavior, relative and absolute level changes, and percent of non-overlapping data.

Table 12

Hannah's Data

Mean (median, range) occurrences				
Target behavior	Baseline	Social Positioning	Training	Maintenance
Eye gaze	0(0, 0-0)	10.2(19, 13-35)	8.6(10, 2-12)	5(5, 5-5)
Vocalization	0(0, 0-0)	0(0, 0-0)	0(0, 0-0)	0(0, 0-0)
Reaching	0(0, 0-0)	0 0, 0-0)	0(0, 0-0)	0(0, 0-0)
SGD activation	10.6(8, 0-39)	46.8(42, 6-104)	5.4(2, 0-14)	4(4, 4-4)
Intentional SGD	0(0, 0-0)	5.2(6, 0-10)	0.8(1, 0-2)	0(0, 0-0)

Between conditions relative level change		
Target behavior	Baseline to Social Positioning	Social Positioning to Training
Eye gaze	13	-2.5
Vocalization	0	0
Reaching	1.5	0
SGD activation	53	-29
Intentional SGD	4.5	-4

Between conditions absolute level change		
Target behavior	Baseline to Social Positioning	Social Positioning to Training
Eye gaze	8	4
Vocalization	0	0
Reaching	3	0
SGD activation	95	0
Intentional SGD	9	0

PND		
Target behavior	Baseline to Social Positioning	Social Positioning to Training
Eye gaze	100%	0%
Vocalization	0%	0%
Reaching	20%	0%
SGD activation	60%	0%
Intentional SGD	80%	0%

Note. The data displayed includes the mean, median, and range in number of times Hannah completed a target behavior, relative and absolute level changes, and percent of non-overlapping data.

Table 13

John's Data

Mean (median, range) occurrences				
Target behavior	Baseline	Social Positioning	Training	Maintenance
Eye gaze	4.6(0, 0-23)	12.2(11, 2-24)	11.4(14, 3-16)	22.7(18, 13-37)
Vocalization	0.2(0, 0-1)	2.5(2.5, 0-6)	2.2(3,0-3)	0(0, 0-0)
Reaching	0(0, 0-0)	0(0, 0-0)	0(0, 0-0)	0(0, 0-0)
SGD activation	1.6(0, 0-6)	31.5(19, 14-95)	45(47, 26-76)	49(51, 22-74)
Intentional SGD	0(0, 0-0)	6.8(5.5, 2-16)	7(8, 4-11)	12.3(6, 5-26)

Between conditions relative level change		
Target behavior	Baseline to Social Positioning	Social Positioning to Training
Eye gaze	19	0.5
Vocalization	4	2.5
Reaching	0	0
SGD activation	14	0
Intentional SGD	8	-1.5

Between conditions absolute level change		
Target behavior	Baseline to Social Positioning	Social Positioning to Training
Eye gaze	6	1
Vocalization	1	5
Reaching	0	0
SGD activation	14	61
Intentional SGD	8	8

PND		
Target behavior	Baseline to Social Positioning	Social Positioning to Training
Eye gaze	17%	0%
Vocalization	50%	0%
Reaching	0%	0%
SGD activation	100%	0%
Intentional SGD	100%	0%

Note. The data displayed includes the mean, median, and range in number of times John completed a target behavior, relative and absolute level changes, and percent of non-overlapping data.

Table 14

Kevin's Data

Mean (median, range) occurrences				
Target behavior	Baseline	Social Positioning	Training	Maintenance
Eye gaze	0 (0, 0-0)	13.7(8, 3-20)	16.2(13, 5-29)	11.7(9, 6-20)
Vocalization	0(0,0, 0)	5.8(0, 0-31)	7.2(11,0-14)	1.7(0, 0-5)
Reaching	0(0, 0-0)	0(0, 0-0)	0(0, 0-0)	0(0, 0-0)
SGD activation	3.2 (0, 0-15)	15.5(8, 0-42)	3.8(2, 0-10)	9.3(4, 3-21)
Intentional SGD	0(0, 0-0)	3.5(6, 0-12)	2(1, 0-7)	3(3, 1-5)

Between conditions relative level change		
Target behavior	Baseline to Social Positioning	Social Positioning to Training
Eye gaze	10	11
Vocalization	4	12.5
Reaching	0	0
SGD activation	0	-32
Intentional SGD	0	-5.5

Between conditions absolute level change		
Target behavior	Baseline to Social Positioning	Social Positioning to Training
Eye gaze	3	7
Vocalization	0	11
Reaching	0	0
SGD activation	0	-29
Intentional SGD	0	-6

PND		
Target behavior	Baseline to Social Positioning	Social Positioning to Training
Eye gaze	100%	40%
Vocalization	33%	0%
Reaching	0%	0%
SGD activation	33%	0%
Intentional SGD	67%	0%

Note. The data displayed includes the mean, median, and range in number of times Kevin completed a target behavior, relative and absolute level changes, and percent of non-overlapping data.

Table 15

Elise's Data

Mean (median, range) occurrences				
Target behavior	Baseline	Social Positioning	Training	Maintenance
Eye gaze	4(0, 0-23)	46.2(50, 11-79)	39.6(34, 18-81)	28(28, 12-44)
Vocalization	0(0,0-0)	0.2(0, 0-1)	0(0,0-0)	0(0, 0-0)
Reaching	0(0, 0-0)	0(0, 0-0)	0(0, 0-0)	0(0, 0-0)
SGD activation	0.2(0, 0-1)	92.2(81, 31-132)	40.8(35, 7-111)	43(43, 30-56)
Intentional SGD	0.2(0, 0-1)	31.4(27, 11-50)	15.6(18, 2-32)	16.5(16.5, 16-17)

Between conditions relative level change		
Target behavior	Baseline to Social Positioning	Social Positioning to Training
Eye gaze	64.5	-7
Vocalization	0.5	0
Reaching	0	0
SGD activation	56	-82.5
Intentional SGD	18	-26.5

Between conditions absolute level change		
Target behavior	Baseline to Social Positioning	Social Positioning to Training
Eye gaze	50	-6
Vocalization	1	0
Reaching	0	0
SGD activation	31	-125
Intentional SGD	11	-44

PND		
Target behavior	Baseline to Social Positioning	Social Positioning to Training
Eye gaze	80%	20%
Vocalization	20%	0%
Reaching	0%	0%
SGD activation	100%	0%
Intentional SGD	100%	0%

Note. The data displayed includes the mean, median, and range in number of times Elise completed a target behavior, relative and absolute level changes, and percent of non-overlapping data.

Table 16

Dulcie's Data

Mean (median, range) occurrences				
Target behavior	Baseline	Social Positioning	Training	Maintenance
Eye gaze	9.7(0, 0-48)	57.2(64, 35-79)	70(69, 51-99)	74.5(74.5, 66-83)
Vocalization	2.5(0,0-15)	6.2(7, 0-12)	10.4(12,3-15)	3(3, 1-5)
Reaching	0(0, 0-0)	3(1, 0-9)	1(0, 0-4)	0.5(0.5, 0-1)
SGD activation	3.3(0, 0-18)	54.4(58, 20-81)	69.8(73, 24-116)	67(67, 49-85)
Intentional SGD	3(0, 0-18)	38(26, 9-73)	55.6(66, 21-92)	41(41, 28-54)
Between conditions relative level change				
Target behavior	Baseline to Social Positioning	Social Positioning to Training		
Eye gaze	49.5	3		
Vocalization	6	-2.5		
Reaching	0.5	-2		
SGD activation	39	-6.5		
Intentional SGD	23	-18		
Between conditions absolute level change				
Target behavior	Baseline to Social Positioning	Social Positioning to Training		
Eye gaze	35	-14		
Vocalization	10	-9		
Reaching	1	-5		
SGD activation	20	-15		
Intentional SGD	20	-33		
PND				
Target behavior	Baseline to Social Positioning	Social Positioning to Training		
Eye gaze	60%	20%		
Vocalization	0%	20%		
Reaching	20%	0%		
SGD activation	100%	40%		
Intentional SGD	80%	20%		

Note. The data displayed includes the mean, median, and range in number of times Dulcie completed a target behavior, relative and absolute level changes, and percent of non-overlapping data.

Table 17

Adah's Data

Mean (median, range) occurrences				
Target behavior	Baseline	Social Positioning	Training	Maintenance
Eye gaze	1.4(0, 0-14)	67.2(71, 57-74)	70.6(65, 60-87)	70(70, 70-70)
Vocalization	0.2(0, 0-2)	8.2(3, 0-33)	2(2,0-4)	0(0, 0-0)
Reaching	0(0, 0-0)	0(0, 0-0)	0(0, 0-0)	0(0, 0-0)
SGD activation	0.8(0, 0-4)	27(32, 13-38)	20.6(16, 11-39)	40(40, 40-40)
Intentional SGD	0(0, 0-0)	19(21, 6-30)	17.8(15, 10-28)	38(38, 38-38)

Between conditions relative level change		
Target behavior	Baseline to Social Positioning	Social Positioning to Training
Eye gaze	65.5	-3
Vocalization	0	-14.5
Reaching	0	0
SGD activation	15	-11
Intentional SGD	9	-6.5

Between conditions absolute level change		
Target behavior	Baseline to Social Positioning	Social Positioning to Training
Eye gaze	60	3
Vocalization	5	-33
Reaching	0	0
SGD activation	17	1
Intentional SGD	12	-2

PND		
Target behavior	Baseline to Social Positioning	Social Positioning to Training
Eye gaze	100%	40%
Vocalization	60%	0%
Reaching	0%	0%
SGD activation	100%	20%
Intentional SGD	100%	0%

Note. The data displayed includes the mean, median, and range in number of times Adah completed a target behavior, relative and absolute level changes, and percent of non-overlapping data.

Social Validity

Of the 24 surveys given during baseline, 20 (83%) were returned and 17 of the 17 surveys (100%) given during maintenance were returned. Twenty surveys were returned during baseline, but due to staffing changes, only 17 of the initial staff members surveyed were able to be surveyed during maintenance. The responses to the survey did not appear to change significantly from beginning to end (See Appendix L).

Demographic Data

The majority of the survey respondents were female, between the ages of 20 and 29, were Caucasian or Hispanic, and worked for the company that managed the developmental training program for less than a year. Most of the respondents (n=15) had a certified nursing assistant position. A smaller number of respondents (n=4) were activity aides who were also trained as certified nursing assistants.

Attitudes

The attitudes of the staff members toward the participants and clients of the developmental training program in general were positive and continued to be positive from the beginning of the study to the end. Over the course of the study, staff members became more familiar with the participants and appeared to have a better understanding of their communication. Staff members strongly believed throughout the study that the participants and all clients should be able to communicate with whomever they wanted.

Barriers and Training

The respondents did not feel strongly that they needed further training on SGDs of any kind or that the participants needed further training. More than half noted that they generally ask *yes* and *no* questions when communicating with participants, and they felt

that the participants and other clients communicated with the staff members more often than anyone else.

Positioning and SGDs

Prior to the social positioning intervention, some staff members felt there were opportunities for the participants and other clients to communicate with one another regularly. Following the intervention, the majority of the staff members felt that there were opportunities for peer communication. The respondents also seemed to be more confident in positioning individuals with SMD-CCN for socialization when they had out-of-wheelchair time. See Table 18 for responses to Likert scale questions regarding attitudes, barriers and training, and positioning and SGDs.

Perceptions

Respondents' perceptions were supportive of social positioning before and after intervention. Responses were summarized from the following open ended questions at the end of the social positioning survey: (a) How do you feel about being asked to position the clients so that they can socialize with each other when they are out of their wheelchairs? (b) Do you have any other ideas that could help the clients communicate with each other when they are out of their wheelchairs? Many stated that they did not mind positioning their clients for socialization and that they thought it was a good idea. Staff members' suggestions included, but were not limited to: (a) more available SGDs, (b) a designated helper to facilitate communication, (c) social positioning groups, and (d) social positioning during aquatic therapy sessions.

Summary

The data gathered were visually analyzed and further analyzed through PND, between conditions relative and absolute level changes, and descriptive data (mean, range, median). A functional relation was noted for eye gaze, SGD activations, and intentional SGD activations when social positioning was introduced. Reaching was demonstrated the least often and fewer participants demonstrated this behavior (Adah, Elise, John, and Kevin did not reach at all during the study). No demonstration of effect was noted for vocalizations or reaching. No functional relation was noted with the addition of training, although communicative behaviors continued to be demonstrated in this phase.

Social validity data collected showed little change in the staff members' perceptions of the participants (or clients in general) before and after intervention which remained positive. Some change was noted in their perception of positioning and SGDs as they felt that they had received training regarding social positioning.

Table 18

Social Positioning Survey Results

	Pre-intervention/Post-intervention (%)				
	Strongly Disagree	Disagree	No Opinion	Agree	Strongly Agree
1. I am familiar with most of the clients.	0/0	5/6	16/0	47/65	32/29
2. I have positive feelings about the clients.	0/0	0/0	0/0	40/29	60/71
3. I feel comfortable helping the clients communicate with others.	0/0	0/0	5/0	55/59	40/41
4. I often do not understand what the clients are trying to communicate.	5/12	32/65	26/6	37/18	0/0
5. I believe that the clients have the right to communicate with anyone they want to communicate with.	0/0	0/0	0/0	4/24	15/76
6. I do not like when the clients have a speech-generating device.	65/47	30/47	5/6	0/0	0/0
7. When the clients have speech-generating devices, it makes my job harder.	58/35	42/53	0/12	0/0	0/0
8. I understand the clients better when they use a speech-generating device.	0/0	5/6	26/12	47/41	21/41
9. I need more training on how to use the complex speech-generating devices the clients use.	5/0	30/31	15/19	30/44	20/6
10. I need more training on how to use the speech-generating devices the clients use that have one or only a few messages.	6/6	22/53	22/12	33/29	17/0
11. I do not need more training on how each client communicates.	15/0	40/53	15/6	25/35	5/6
12. The clients need more training on how to use the more complex speech-generating devices.	10/6	10/19	30/31	45/44	5/0
13. The clients communicate with staff members most often.	0/0	5/0	11/12	74/71	11/18
14. Our clients do not have opportunities to communicate with each other often.	20/0	55/81	15/6	10/13	0/0
15. I do most of the "talking" when communicating with our clients.	5/0	20/13	15/31	50/56	10/0
16. I have a hard time waiting for clients to respond to my questions.	20/12	45/53	10/24	20/12	0/0
17. I generally ask the clients questions that require <i>yes</i> and <i>no</i> responses.	0/0	5/24	5/0	80/71	10/6
18. I think it's important for the clients to socialize even when they are out of their wheelchairs.	0/0	0/0	0/0	55/59	45/41
19. Out-of-wheelchair time is for pressure relief and relaxation only.	22/12	50/53	17/18	6/6	6/12
20. I often position clients in ways that are convenient for me.	20/0	60/88	20/6	0/6	0/0
21. I do not know what to do for the clients when they are out of their wheelchairs when it comes to communication and socialization.	20/12	45/82	15/6	20/0	0/0
22. I offer speech-generating devices to most clients regularly when they are in their wheelchairs.	0/0	15/19	30/19	55/56	0/6
23. I offer speech-generating devices to most clients regularly when they are out of their wheelchairs.	0/0	25/19	25/13	45/63	5/6

Note. This table includes the responses to the Likert scale questions included in the social positioning survey. The percentage was adjusted when a respondent left a question blank. Percentages were rounded up to the next whole number.

CHAPTER V

DISCUSSION

The results of this study extend the literature regarding the communication of individuals with SMD-CCN and in particular, how others can assist these individuals to communicate with their peers through social positioning. This study showed that out-of-wheelchair time can be used for more than resting and repositioning for pressure relief. In fact, it showed that when these individuals are positioned facing one another at no more than 3 ft apart, they will communicate with each other if they choose to do so. It also showed that just like adults without disabilities, communication is variable day-to-day. When training was added to social positioning, it showed that there was little difference from not having any training, but that individuals continued to communicate. Maintenance data was variable and seemed to depend on the individual as to whether or not their communication maintained after more frequent sessions of the intervention.

This chapter provides a summary of the results and the limitations of the study. A discussion of how this study adds to the literature regarding the communication of individuals with SMD-CCN is included as well as the future implications at the conclusion of this chapter.

Conclusions

In this study, social positioning provided an opportunity for adult peers with SMD-CCN to socialize with one another during their out-of-wheelchair time.

Participants were within 3 ft of their peers and facing each other (or with the opportunity

to face each other by using a head turn) which, in many cases, allowed them to increase their eye gaze, number of reaches, vocalizations, SGD activations, and intentionality of SGD activations.

During baseline, occurrences of all of the target behaviors were at or near zero for most of baseline and before moving to social positioning. It is possible that SGD activations in the first few sessions were a result of novelty despite presenting them before videotaping to reduce novelty. It is also likely that the other target behaviors were infrequent as partners often could not see each other due to physical barriers (furniture, staff members, other clients) in their line of sight, distance from one another, or due to their position (facing away from partner).

In the social positioning condition, all participants demonstrated greater instances of eye gaze, vocalizations, SGD activation, and intentional communication with SGDs and from baseline. Participants may have been motivated to communicate with their partners once they were in proximity and were facing each other. Participants demonstrated functional relations in eye gaze (e.g. Calvin-Betty, Irene-Hannah, Elise-Dulcie), SGD activations (Calvin-Betty, Irene-Hannah, Elise-Dulcie), and intentional SGD activations (John-Kevin, Elise-Dulcie). There was a functional relation observed between baseline and social positioning with SGDs for all participants though a weaker demonstration of effect for Betty and Kevin. Eye gaze increased with the introduction of social positioning for all participants elucidating a functional relation (though weaker for Kevin). Vocalizations occurred more often by participants in social positioning than in baseline; however, no functional relation could be made. While reaching occurred infrequently for the two participants who chose to reach during the social positioning

condition, no functional relation could be determined. There was little change between social positioning and social positioning with participant training in the demonstration of target behaviors; however, 8 out of the 10 participants had slight increases in the mean occurrences of at least one behavior (excluding Elise and Hannah). Maintenance data for social positioning with training were variable. SGD activations increased for 6 of the 10 participants (excluding Hannah, Irene, John, and Betty), eye gaze increased or maintained for 4 of the 10 participants (Kevin, Faith, John, Adah), vocalization increased for 2 of the 10 participants (Kevin and Dulcie), and intentional SGD activations increased or maintained for 5 of the 10 participants (Kevin, Dulcie, Elise, Adah, and Faith). Reaching increased minimally for Calvin and Dulcie during the maintenance condition and remained at zero for the other participants.

This supports studies that showed that body position and the availability of SGDs had positive effects on interaction (Hostyn & Maes, 2009) and that proximity to SGDs and peers as well as other factors such as staff orientation were related to increased interaction (Chung & Carter, 2013). In some cases, the gains in the number of target behaviors were very small and more often than not, were inconsistent. For example, reaching did not occur with every participant, but did occur for a limited number of participants in social positioning (Dulcie, Faith, Hannah), social positioning with training (Irene, Hannah, Dulcie, Calvin, Faith), and maintenance (Calvin, Dulcie). It is possible that reaching was more personal than eye gaze, vocalization, or SGD activation and as such did not occur as often due to participant comfort. The participants that did reach for their partners tended to be more outgoing than the participants that did not reach. Another possibility is that although all of the participants could reach, the upper

extremity range of motion was decreased for the participants that chose not to use that mode of communication.

During social positioning with training, participants continued to be within 3 ft of their peers and facing each other (or with the opportunity to face each other by using a head turn). A brief, scripted training was provided to explain to the participants what they could do to communicate with each other (activate the SGD, look at each other, reach, vocalize) and that if they looked at each other in combination with SGD activation, reaching, or vocalizing, the partner would know the message was for them. A modified ALS style of teaching was provided when discussing the activation of SGDs by pointing to the SGD, naming the message, activating the SGD, and asking for a return demonstration from the participant (hand-over-hand assistance was given if a return demonstration was not completed upon request). In this condition, all participants continued to demonstrate the target behaviors, but in many cases there was a decrease in mean occurrences for at least one target behavior (Kevin, John, Adah, Faith, Elise, Hannah, and Irene). The reason for this is unclear. One possibility is that the training was too challenging for the participants to understand despite best efforts to make it as simple and clear as possible. Other possibilities are that the training condition needed to be longer or implemented in place of the social positioning condition. The response to the modified ALS during the training condition did not mirror the growth in expression that other studies that used ALS did; however, the implementation was not as stringent as other studies that were strictly looking at ALS as an intervention (Beck, Stoner, & Dennis, 2009; Harris & Reichle, 2004).

All of the participants made gains in at least eye gaze and SGD activation at some point during social positioning or social positioning with training. The fewest gains were made in vocalizations and reaching. Most participants had variable data paths despite these slight gains. One explanation is that, because these individuals rely so heavily on others, every day is not exactly the same for them. For example, Calvin communicated when something was bothering him such as when he was hot, wet, or uncomfortable in the stander at any given time which could have impacted his demonstration of the target behaviors. An adult without disabilities could take care of these issues himself or herself, but because Calvin had to wait for someone to determine what was bothering him and further wait for the resolution, something bothersome may have been the focus of his attention more so than socialization at any given time. Betty was another example of a participant with variable data. There were days that she would put her head down and refuse to look at her partner or activate her SGD. Staff members surmised that this could be because she disliked being in the stander. As for social positioning with training, they felt that perhaps she disliked being asked to complete tasks (common for her with other tasks) and saw the training as a task being requested of her. Overall, the participants communicated with their peers more often during social positioning with and without training conditions when they wanted to because they had the choice to do so.

During the maintenance condition, training continued along with social positioning though data were collected less frequently (approximately every other week versus up to five times per week). The result was variable based on the individual. Vocalization and reaching tended to maintain or decrease by the end of the study. Some participants maintained or had improvements in SGD activation only (Calvin, Faith,

Elise, Dulcie) or SGD activations and intentional SGD activations (Kevin, Adah). The remaining participants' SGD activation and intentional SGD activation data decreased in maintenance (John, Hannah, Betty, Irene). Participants who were able to have more maintenance sessions tended to show variability and levels similar to what they had in the social positioning with and without training conditions. It should not be assumed that all target behaviors would stop during maintenance in cases of decreasing data points as data were variable throughout the study.

Similar to other studies of intentional communication with this population, not all of the observed behaviors translated into intentionality and not all of the participants responded to the intervention in the same manner (Iacono, Carter, & Hook, 1998). In general, the more often the participants activated a SGD, the more opportunities they had to intentionally communicate even if only slightly.

A survey was given to staff members working with the participants before social positioning and after social positioning with training. The staff members had positive feelings about the participants (and all of the clients in general) throughout the study. Staff members reported becoming more familiar with the participants and reported a better understanding of their communication and social positioning by the end of intervention. From beginning to end, staff members strongly believed that the participants (and all of the clients) should be able to communicate with whomever they wanted. They also felt that the participants had opportunities to communicate with their peers regularly; however, they noted that the participants talked to staff members most often. It is possible that the staff members felt that being in the same room or sitting next to a peer was enough of an opportunity to communicate as it is for adults without

disabilities. In addition, over half of staff members felt that they generally communicated with the participants by asking *yes* and *no* questions. This may be because of some of the aforementioned communication partner barriers that require training such as (a) the staff members fail to pause long enough for the participants to respond (Weiner, 2005), (b) staff members monopolize the conversation (Clarke & Wilkinson, 2007), (c) or do not offer communication devices consistently (Carter, Chung, & Sisco, 2012) making it difficult for participants to answer in a manner apart from *yes* and *no*.

Limitations

Some of the limitations of this study were a result of the design or the environment while others related to the participants. Given that this study dealt with individuals who were completely dependent on others to meet their needs, there were many possible limitations to discuss. The first is simply mood. Individuals without disabilities do not communicate with their peers at the same rate daily and individuals with SMD-CCN are no different. On some days, participants were tired, possibly feeling sick, distracted, anxious, or any other number of communication-affecting moods. In addition, the participants' moods were at times visibly different based on the staff members in the developmental training classroom that day. Seeing a preferred staff member could cause a participant to become excited leading to greater or fewer SGD activations, or draw attention away from the dyad partner causing intentional communication to be directed at the staff member and not the dyad partner. In other cases, it could cause the participant to be more attentive to the task so as to show the preferred staff member how well they could perform. Non-preferred or unfamiliar staff members, on occasion, caused anxious looks or a refusal to participate. A staffing crisis

that began shortly after the onset of the study caused staff members to be inconsistent throughout the study, but this crisis gave the researcher and the participants the opportunity to show and explain to a greater number of people the importance of positioning for socialization.

This study was researcher-led and would have been stronger if it had been led by the staff members who worked with the participants daily. As mentioned earlier, however, this was impossible due to a staffing shortage causing a much greater than usual variety of staff to be involved with each participant weekly.

Another limitation that existed in this study was the slight deviations in position that altered the expression of the target behaviors. On occasion, a participant would be positioned as recommended, but the staff members and I were unable to position the participant's body or SGD "just right" causing difficulty reaching the SGD or turning his or her head for eye gaze most effectively despite our best efforts. Though it was not common, it resulted in a decrease in one or both of these target behaviors. At times when it was difficult to position the SGD, the participant had to rely on the researcher or a staff member to retrieve it if it fell or readjust it if it was moved from the original position. In baseline, the SGD was not replaced if it fell unless a staff member noticed. In social positioning the staff were trained to put it back where it belonged if the researcher was not available; however, there were times that it was overlooked for short periods of time.

A possible limitation related to SGDs was that the messages never changed over the many months of the study. Although this could have benefitted the participants by decreasing novelty and increasing familiarity with the messages, they could have also

become tired of saying the same messages. The same could be true of having the same partner throughout the study.

Another possible limitation was that contingent verbal praise and feedback were inconsistent. It was stated that it would be intermittent and it was. Unfortunately, depending on the participants' performance or activities occurring in the classroom at the time of videotaping, it was not given consistently across days or participants. Because encouragement was very specific, if the participant was not performing certain target behaviors, the encouragement was not provided. For example, if a participant looked at a partner, the encouragement might be, "Good job pushing your SGD. Don't forget you can look at your partner so they know you are talking to them." In this case, reaching and vocalization were not encouraged.

Due to time constraints, the social positioning with training and maintenance conditions were shorter than desired. A longer social positioning with training condition could have increased the demonstration of the target behaviors potentially leading to more stability. A longer maintenance condition could have indicated whether participants would be able to continue to socialize during out-of-wheelchair time given less and less frequent visits by the researcher.

The training and encouragement provided during the social positioning with training condition could have been more systematic (e.g., increased training sessions, prompting and fading) to offer better opportunities for the participants to learn about social positioning. This could have further increased their communicative competence and potentially their demonstration of the target behaviors.

A limitation in the design included not returning to social positioning after the social positioning with training condition. This decision was made by the researcher in an effort to give as much training to the participants as possible. I felt that it was in the participants' best interest to receive training and then continue into maintenance with less frequent training rather than go back to social positioning where there was no instruction or explanation.

IOA data for the target behaviors was collected by video, but the rater had access to the author's data sheets. Although the rater and the author discussed any differences and then re-watched the videos until an agreement was made, it would have been better to have the rater simply watch the videos. In the future, the rater should not have access to the author's data. Either the author should calculate the differences in data or a third rater should calculate the difference.

Additionally, participants in this study were part of a congregate care setting which does not fully represent the general population of individuals with disabilities (Ogletree, Bartholomew, Wagaman, Genz, & Reisinger, 2012). Although this research adds to the literature on individuals with SMD-CCN in congregate care settings, generalization may be limited as not all individuals with SMD-CCN attend developmental training or day programs.

This study began with 12 participants and ended with 10 due to unforeseen events. This was a limitation in that there were less data to analyze to promote generalization across multiple participants. However, a functional relation could still be demonstrated, since the participants who withdraw were paired with participants in different tiers of the study.

Implications

This study enriched the available literature of studies of individuals with SMD-CCN in regards to availability of AAC (Hostyn & Maes, 2009), positioning for AAC access (McEwen & Karlan, 1989), body position for optimal interaction (Girolametto & Weitzman, 2007; Hostyn & Maes, 2009), and proximity and staff training (Chung & Carter, 2013). It corroborated Hostyn and Maes by showing that SGDs did have a positive effect on interaction as a functional relation was noted when social positioning was introduced and participants increased their use of their SGDs as well as increasing the intentionality of the SGD activations. It also substantiated Girolametto and Weitzman's study that suggested that body position affected interaction as social positioning is not possible without facing a partner. When staff members were provided with training on how to facilitate communication through social positioning, peers were trained on how to communicate, and I provided access to SGDs, I was able to facilitate increased communication with these dyads. This was similar to other studies that facilitated communication between peers with disabilities and peers without disabilities (Causton-Theoharis, 2009; Causton-Theoharis & Malmgren, 2005a; Causton-Theoharis & Malmgren, 2005b; Chung & Carter, 2013; Girolametto & Weitzman, 2007).

Although social positioning with training did not show the same functional relation that social positioning did in relation to the target behaviors during baseline, it showed that the target behaviors can be still be elicited often when training was added. Following social positioning, it was important to train the participants in this study because we would not expect adults without disabilities to perform a task to the best of their ability without telling them how to do it. The participants did, however, perform in

social positioning prior to training which indicated that they understood more than we often give them credit for. Training simply added another level of dignity and normalization to a situation that already provided opportunity. Increased and more systematic training should be considered in the future.

The maintenance condition was important in determining if the participants would continue communicating when social positioning with training was reduced to every other week. Some of the participants were able to and some were not. This was significant because it showed that despite making gains during social positioning and social positioning with training; individually they may have required different supports when training decreased in frequency.

This research added to what is known about individuals with SMD-CCN in general, but specifically adults with SMD-CCN and what can be done to increase the opportunities for these individuals to socialize with their peers. It was once said that “for normalization to be realized fully, people who are mentally retarded must not only live in a typical community setting, they must be in a position to interact freely with others in their environs” (Scheerenberger, 1987, p. 118). When individuals with SMD-CCN can communicate with their peers they are one step closer to the normalization that has been sought for them for decades.

The hope is that this research will help further change the culture of how we think of individuals with SMD-CCN. Further, the hope is that it will provide more opportunities for them to develop and maintain their own friendships and social interactions in relation to their own strengths and improve their quality of life. This research helped participants exercise a right to communicate that is the right of every

human being in every setting. The dissemination of the results of this study will likely help more individuals in developmental training programs, but may also help other individuals with similar disabilities in different settings realize their potential as peer communicators.

Future Research

Further research into positioning for social interaction for adults with SMD is needed to replicate the findings of this study and extend its external validity. In light of the results of this study, future research seems promising. Future research could focus on replicating and refining this or any study related to the intentional communication or further coding of intentional communication for this population (Bruce & Vargas, 2007; Iacono, Carter, & Hook, 1998). This study could be refined by making contingent verbal praise and feedback more consistent, incorporating more staff involvement, etc. Other research ideas include: social positioning in out-of-wheelchair groups, using different SGD messages, different partners (with or without disabilities or both), different settings or times of day, comparison with the general population, or how to increase the communication that is elicited to be more functional (e.g., in relation to a task or game). Further, studies on individuals with SMD-CCN and social positioning with their peers while they are in their wheelchairs would continue to benefit this population. Future studies of social positioning with this population should encourage participants to choose their own partners in order to maximize possible communication and increase independence. Additionally, staff orientation was important in this study not only for explaining social positioning, but for helping the caregivers understand that the

potential of the participants did not stop when the participants were out of their wheelchairs. Staff training should be a part of social positioning going forward.

Future research should also delve into finding the most effective ways to teach communication. Perhaps more teaching with ALS would have improved participant performance during social positioning with training and maintenance due to more exposure to the information and more practice. For instance, providing training before the participants had out-of-wheelchair time and then again immediately after they were in position. ALS training on days that they were not in social positioning with training may have been further helpful to solidify the idea. Training may have been successful with video modeling as well. It has been a proven method for teaching adults with disabilities a variety of new skills (Beiderman & Freedman, 2007; Elias, Goyos, Saunders, & Saunders, 2008; Mechling & Gast, 2003; Mechling, Gast, & Gustafson, 2009). Or perhaps a combination of the two would be well suited for social positioning research. Another intervention possibility might include Milieu Teaching or Prelinguistic Milieu Teaching which involve levels of mand-modeling and incidental teaching and has been used with individuals with SMD-CCN (Fey, et al., 2006; Parker-McGowan et al., 2014).

Summary

We know that adults with SMD-CCN learn and communicate differently than adults without disabilities. We know, too, that SGDs can give a voice to those without a voice. Furthermore, we know that proximity and environmental arrangement can have an impact on communication. It is simply a matter of taking this knowledge and putting it together to give greater opportunities to individuals who cannot create their own opportunities. By providing the possibility of socializing with peers in this study, we

created opportunities for symbolic and nonsymbolic communication to occur and a window for communication to be intentional.

The purpose of this study was to investigate the communication between adult peers with SMD-CCN when they were out of their wheelchairs and the provided SGDs, positioning, and proximity to facilitate social communication. The multiple probe design across dyads was selected as the best way to determine if a functional relation between the intervention of social positioning (or social positioning with training) and nonsymbolic and symbolic communicative behaviors existed. Ten participants completed the study and all showed gains in some or all of the nonsymbolic and symbolic communication target behaviors during social positioning. Many demonstrated functional relations. The participants continued to exhibit the target behaviors when training was introduced to social positioning. Four of the 10 participants did not maintain their demonstrations of any of the target behaviors during the maintenance condition and the other six maintained at least SGD activations if not a combination of SGD activations, intentional SGD activations, and eye gaze.

Beyond eliciting target behaviors, this study provided opportunities for adults with SMD-CCN to communicate with dignity and hopefully begin to improve their quality of life. The provision of proximity, positioning, and SGDs allowed them to reach or come closer to communicative competence than ever before.

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APPENDIX A
PARTICIPANT CHARACTERISTICS

Participant Pseudonym (classroom)	Age, Gender, SGD used, race, ethnicity	Diagnoses	Development (test scores, descriptive information)	Goals related to communication or SGD use	Skills/Competence related to SGD use	Other goals	Time out of chair at DT (total/each time)
1. Calvin (A)	35y, M, Cheap Talk 8, Caucasian American	Cerebral palsy, spastic quadriplegia, severe intellectual disability, dysphagia with gastrostomy	IQ score 24 on the Slosson Intelligence Test administered 8/11/12; CMF enjoys watching classic TV shows on his iPad, going on outings, spending time with preferred staff members, swimming in the onsite pool, and completing cognitive activities with assistance on a computer	1. Maintain a conversation with a staff member or peer using a Dynavox Vmax after set-up and instructions with supervision. 2. Activate a SGD when ready to take medicine given supervision.	Receives OT treatment approx. 45 min/week for device programming/SGD trials of alternate devices/access method evaluation.	1. Make a correct response to information just learned 4x in 10 min with supervision. 2. Given a photograph of a person to receive a delivery, CMF will deliver the correct object to a staff member with supervision. 3. CMF will drive his power wheelchair x15 min with verbal cues and min assistance.	Approx. 2 hours in a.m. and in p.m. as requested
2. Betty (A)	56y, F, LITTLE Step-by-step, African American	Profound intellectual disability, cerebral palsy, congenital encephalopathy, microcephaly, spastic quadriplegia, dysphagia, visual impairment	IQ score 15 on the Slosson Intelligence Test administered 12/13/13; BRB enjoys socializing, attending any available group activity, observing staff members interact, eating chocolate,	1. Activate a button as requested on a GoTalk8 to communicate given minimal cueing. 2. Make choices, requests, and answer yes/no questions on a GoTalk8 given minimal cueing.	Yearly evaluation and treatment as needed for all therapeutic disciplines; Uses GoTalk8 when motivated.	1. Sit on the edge of a posture bench for 5 min with minimal assistance. 2. Stand up from her chair by keeping both feet on the ground for 1 min with minimal assistance.	Approx. 1-2 hours in a.m. only

			and wearing make-up; she often dislikes being told what to do				
3. John (B)	37y, M, LITTLE Step-by-step, Caucasian American	Profound intellectual disability, cerebral palsy, seizure disorder	IQ score 13 on the Slosson Intelligence Test administered 12/10/13; JJM enjoys telling jokes using his SGD, socializing with any available staff member, volunteer, or peer, being pushed in his wheelchair, and eating dessert	1. State the day of the week following orientation to the day using a Tobii T10 given no more than one cue. 2. Greet others as appropriate using a Tobii T10 with supervision.	Yearly evaluation and treatment as needed for all therapeutic disciplines; Uses SGD daily outside of classroom door for greeting guests;	1. Activate a switch to play music with supervision. 2. Fold pre-scored greeting cards with minimal assistance. 3. Follow directions 3x while assisting a session leader.	Once per day for approx. 1 hour
4. Kevin (B)	26y, M, LITTLEmack, Caucasian American	Profound intellectual disability, seizure disorder, dysphagia with gastrostomy, cerebral palsy with spastic quadriplegia, congenital hydrocephalus	IQ score 5 on the Slosson Intelligence Test administered 12/10/15; KGF likes to greet others, enjoys socialization when he is spoken to in a sing-song manner, and likes to have something to hold	1. Activate a SGD to make a request given moderate cueing.	Yearly evaluation and treatment as needed for all therapeutic disciplines; Uses SGDs when offered.	1. Stand in a stander for 25 min. 2. Maintain attention at least 4x for at least 4 s during a 5 min activity.	Spends most of day out-of-wheelchair; Approx. 3-4 hours

5. Dulcie (C)	44y, F, LITTLEmack w/button switch, Caucasian American	Profound intellectual disability, encephalopathy secondary to meningitis, spastic quadriplegia, dysphagia, multiple contractures	IQ score 2 on the Slosson Intelligence Test administered 6/23/13; DLU loves to socialize with any available staff member, volunteer, or peer; she likes outings and group activities; there is not much that makes her unhappy	1. Follow commands to activate a SGD to make a request given minimal cueing.	Yearly evaluation and treatment as needed for all therapeutic disciplines; Uses SGDs when offered.	1. Demonstrate attentiveness for 50% of a 5 min activity. 2. Hold head in midline while short sitting for 5 min with maximum assistance.	Once per day in a.m. for approx. 1-2 hours
6. Elise (C)	28y, F, LITTLEmack w/credit card switch, African American	Profound intellectual disability, cerebral palsy, acquired encephalopathy, spastic quadriplegia, microcephaly, seizure disorder, multiple contractures, dysphagia with gastrostomy, visual impairment, gastroesophageal reflux disease	IQ score 2 on the Slosson Intelligence Test administered 5/13/12; ESE likes to socialize with any available staff member, volunteer, or peer; she likes outings and group activities; there is not much that makes her unhappy	1. Activate a SGD to greet others on command with moderate cues.	Yearly evaluation and treatment as needed for all therapeutic disciplines; Uses SGDs when offered.	1. Perform activities with upper extremities for 2 min with maximum assistance. 2. Short sit at the edge of a bolster for 5 min with moderate assistance. 3. Demonstrate attentiveness at least 4x during a 4 min turn taking activity.	Once per day in a.m. for approx. 1-2 hours
7. Faith (D)	52y, F, LITTLE Step-by-Step, Caucasian American	Profound intellectual disability, cerebral palsy, dysphagia with gastrostomy,	Peabody Picture Vocabulary Test-4 age equivalent 2:2; IQ score 18 on the Slosson	1. Initiate communication with a staff member using an AlphaTalker given minimal cues.	Yearly evaluation and treatment as needed for all therapeutic disciplines; Uses	1. Ambulate in a gait trainer for 10 steps with moderate assistance.	Once per day in a.m. for approx. 1-2 hours

		gastroesophageal reflux disease	Intelligence Test administered 12/9/15; FSS loves to socialize with any available staff member, volunteer, or peer; she enjoys coloring, outings, driving her power wheelchair, making choices, and informing staff members of any difficulty her peers are having.		AlphaTalker or GoTalk8 when offered.	2. Remain on task for 5½ min given redirection up to 2 times if necessary.	
8. Adah (A)	38y, F, LITTLEmack, Caucasian American	Severe intellectual disability, cerebral palsy, spastic quadriparesis, dysphagia with gastrostomy, seizure disorder	IQ score 2 on the Slosson Intelligence Test administered 6/28/14; AJW likes to socialize with others as well as observe; She is particularly interested in magazines, nail polish, and handsome men	1. Activate a SGD to greet others on command given minimal cues. 2. Answer yes/no questions by using eye pointing to pictures given moderate cueing.	Yearly evaluation and treatment as needed for all therapeutic disciplines; Uses SGDs when offered.	1. Short sit on the edge of a bed or at table for 5 min with minimal assistance. 2. Given initial placement of a writing tool in her hand, she will color/paint a small shape on an art project with minimal assistance.	Out of chair most of day; Approx. 3-4 hours
9. Irene (E)	44y, F, LITTLEmack, Caucasian American	Profound intellectual disability, microcephaly, congenital encephalopathy,	IQ score 2 on the Slosson Intelligence Test administered 12/16/13; ICA	1. Activate a SGD to communicate with a peer with minimal cueing.	Yearly evaluation and treatment as needed for all therapeutic disciplines; Uses	1. Explore objects of interest while standing in the stander.	1-2 times per day for approx. 1 hour each

		hypotonic athetoid quadriparesis, visual impairment, dysphagia with gastrostomy, gastroesophageal reflux disease	enjoys socializing and shows a sense of pride when communicating with SGDs; She is often smiling		SGDs when offered.	2. Attend to an activity 3x in 5 min given physical assistance and minimal verbal cueing while turn-taking.	
10. Hannah (E)	45y, F, LITTLE Step-by-Step, African American	Profound intellectual disability, acquired encephalopathy, multiple contractures, seizure disorder, spastic triplegia, dysphagia,	IQ of 7 score on the Slosson Intelligence Test administered 11/23/14; HVG loves to listen to music and wear headphones; she likes to shake hands on occasion, attend outings and explore; she is a picky eater	1. Activate a SGD to greet others on command given no more than 1 verbal cue.	Yearly evaluation and treatment as needed for all therapeutic disciplines; Uses SGDs when offered, but requires motivation.	1. Fold 5 clothing protectors given moderate assistance. 2. Attend to an activity for 5 s given 2 or fewer verbal cues.	Once per day in a.m. for approx. 1-2 hours

APPENDIX B
TARGET BEHAVIOR SCREENING

Participant Pseudonym	Can participant localize eye gaze to the speaker?	Number of times eye gaze was localized to the speaker divided by number of opportunities (3/4)	Can participant vocalize?	Can participant reach out in front of himself or herself toward the speaker?	Can participant activate a SGD? How?	Number of times SGD was activated when presented divided by number of opportunities (3/4)	SGD selected and selection technique	Best message(s) per staff
1. Calvin	Yes	4/4	Yes	Yes	Right or left hand; On command without cues or prompts; Able to activate SGDs spontaneously	4/4	Cheap Talk 8; able to activate multiple messages	(a) Hi (b) What's up? (c) Let's chat (d) Look at me (e) Say something to me (f) smile (g) Glad to see you (h) I like hanging out with you
2. Betty	Yes	4/4	Yes	Yes	Right hand; On command without cues or prompts; Able to activate SGDs spontaneously	4/4	LITTLE Step-by-step; activates in one location best, but understands multiple messages	(a) Look at me (b) How's it going?
3. John	Yes	4/4	Yes	Yes	Left hand; On command without cues or prompts; Able to activate SGDs spontaneously	4/4	LITTLE Step-by-step; activates in one location normally, but understands multiple messages	(a) Hey, look at me! (b) How's it going? (c) It's great to hang out with you

4. Kevin	Yes	3/4	Yes	Yes	Left hand; On command with minimal verbal cues; Able to activate SGD spontaneously	4/4	LITTLEmack; activates in one location best	Hey, I'm having a great time here with you
5. Dulcie	Yes	4/4	Yes	Yes	Left head turn; On command with minimal verbal cues; Able to activate SGD spontaneously	3/4	LITTLEmack; requires head switch connectivity d/t limited mobility	(a) What a great day, huh? (b) We get to hang out!
6. Elise	Yes	4/4	Yes	Yes	Right hand; On command with minimal verbal cues; Able to activate SGD spontaneously	3/4	LITTLEmack; requires switch connectivity d/t limited mobility	Hey, let's chat!
7. Faith	Yes	4/4	Yes	Yes	Right or left hand; On command without cues or prompts; Able to activate SGD spontaneously	4/4	LITTLE Step-by-step; activates in one location best; understands multiple messages	(a) Hey, what a great day (b) Let's chat (c) Look over here

8. Adah	Yes	4/4	Yes	Yes	Left hand w/SGD or right hand with button connected to SGD; On command with minimal verbal cues; Able to activate SGD spontaneously	3/4 both	LITTLEmack; activates in one location best	Hey, it's good to hang out with you. What's new?
9. Irene	Yes	4/4	Yes	Yes	Left hand; On command with minimal verbal cues; Able to activate SGD spontaneously	4/4	LITTLEmack; activates in one location best	Hey, look at me! Let's chat
10. Hannah	Yes	4/4	Yes	Yes	Right hand; On command with minimal verbal cues; Able to activate SGD spontaneously	4/4	LITTLE Step-by-step; activates in one location best; understands multiple messages	(a) Woohoo! (b) Hey, girl! (c) Let's chat (d) How's it going?

APPENDIX C
POSITIONING SCREENING

Name	Out-of-wheelchair positions attempted by PT or PTA and SLP at screening	Best position for this participant to promote all target behaviors	Reason for best position (any other positions were not attempted per PT's or PTA's advice and recommendations). These positions were not unfamiliar to participants	Equipment needed
1. Calvin	Sidelying on wedge (both sides); sidelying on mat; stander	Stander	Stander prevented participant from having too many uncontrolled movements of all extremities and promoted best access to SGD while promoting eye gaze	Stander
2. Betty	Stander; seated in rocking chair; left sidelying on wedge	Stander	Stander promoted best eye gaze and SGD access; rocking chair was too low to communicate with partner, wedge seemed unsafe	Stander; pillows on sides to support position and comfort
3. John	Sidelying and supine on wedge (both sides); supine on mat	Right modified sidelying (in between side and supine) on wedge	Increased movement in supine on mat caused too much movement away from original position and SGD; best SGD access with left hand and best head movement for eye gaze with slight right sidelying	Wedge with straps, pillow for under head, rolled blanket under left shoulder, two foot high platform under left hand to hold SGD
4. Kevin	Right sidelying on wedge; Bouncing chair	Bouncing chair	Participant did not appear safe on wedge as he attempted multiple times to get out of position; Appeared comfortable and able to demonstrate all behaviors in Bouncing chair	Bouncing chair
5. Dulcie	Prone over wedge; supine on wedge; sidelying on wedge (both sides)	Sidelying on wedge (either side)	Participant appeared most comfortable in sidelying position and was able to turn head both ways to activate a SGD on either side of her head	Wedge with straps, body pillow or similar behind one side to encourage sidelying; pillow between legs, no pillow for head
6. Elise	Prone over wedge; supine on wedge; sidelying on wedge (both sides)	Modified sidelying (in between side and supine) on wedge or supine	Participant appeared most comfortable in modified sidelying position or supine and was able to turn head both ways for eye gaze; activates SGD with either hand near mid-section	Wedge with straps, pillow under or between legs, pillow for head

7. Faith	Left sidelying on wedge; sitting in bean bag	Left sidelying	Occasional difficulty activating SGD in this position, but bean bag is not preferred by PTA for postural reasons; agreed will go to bean bag if having difficulty with sidelying	Wedge with straps, positioning pillows behind back, between legs, under head or bean bag with pillow under left arm
8. Adah	Supine on wedge; left sidelying on wedge	Left sidelying on wedge	Promoted use of right hand for SGD activation as well as other behaviors	Wedge with straps, pillow behind back, between knees, and under head
9. Irene	Prone over wedge; supine on wedge; supine on mat	Prone over wedge	Promoted use of right hand for SGD activation as well as other behaviors; Most conducive to decreasing many uncontrolled movements	Wedge with straps, bolster under feet
10. Hannah	Right sidelying on wedge; variable axis swing; Bouncing chair	Right sidelying on wedge	Promoted use of left hand for SGD activation as well as other behaviors	Wedge with straps, pillow under head, behind back, between knees

APPENDIX D
DATA RECORDING FORM

Name of Participant:	Dyad Partner:
SGD/Message:	Date/Time:
Distance from dyad partner:	Activity for Participant:
Other people in room:	Other activities in room:
Condition:	Observation No:
Other Info:	

	Time	Eye Gaze (to partner)	Reach (to partner)	Vocalize (to partner)	SGD activation/ intentional SGD activation	Verbal Praise and/or feedback
	30"					
1'	00"					
1'	30"					
2'	00"					
2'	30"					
3'	00"					
3'	30"					
4'	00"					
4'	30"					
5'	00"					
5'	30"					
6'	00"					
6'	30"					
7'	00"					
7'	30"					
8'	00"					
8'	30"					
9'	00"					
9'	30"					
10'	00"					
10'	30"					
11'	00"					
11'	30"					
12'	00"					
12'	30"					
13'	00"					
13'	30"					
14'	00"					
14'	30"					

15'	00''					
	Time	Eye Gaze (to partner)	Reach (to partner)	Vocalize (to partner)	SGD activation	Verbal Praise and/or feedback
15'	30''					
16'	00''					
16'	30''					
17'	00''					
17'	30''					
18'	00''					
18'	30''					
19'	00''					
19'	30''					
20'	00''					

Sketch of participant positioning:

APPENDIX E
TASK ANALYSIS OF BASELINE CONDITION

Task Analysis of Baseline

_____ Take a wide shot of the room.

_____ Greet participants.

_____ Check with classroom supervisor and/or nurse to determine if it is a good time to work with the individuals.

_____ Set up cameras so each participant's eye gaze, vocalizations, SGD activations, and reaching can be observed clearly.

___ provide the SGDs deemed appropriate by the prescreening to participants

___ orient each participant to his or her partner

___ orient each participant to SGD

___ activate SGD for participant as a model and to confirm functionality or have the participant do so

_____ Videotape for 20 min immediately after individual is repositioned out of his or her wheelchair.


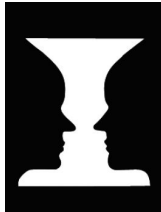

_____ Offer intermittent and general positive reinforcement to the participant.

_____ Thank the participants and classroom.

_____ Remove cameras.

APPENDIX F
SOCIAL POSITIONING CHECKLIST AND TAKE HOME
HANDOUT FOR STAFF MEMBERS

Checklist for Positioning Peers with SMD-CCN for Optimal Communication and Socialization

<p>___ Clients are out of their wheelchairs</p>	
<p>___ Clients no more than 3 ft apart</p>	
<p>___ Clients facing each other</p>	
<p>___ Clients positioned on equipment/pillows/etc. following recommended guidelines</p>	
<p>___ Provide a speech-generating device (SGD) that they can reach</p>	
<p>___ The clients are able to activate the devices provided</p>	
<p>___ Show them an example of what happens when you activate the SGD</p>	
<p>___ Praise successful communication and remind them of all the ways they can communicate!</p>	

Everyone has the right to communicate and has a fundamental
right to social relationships



- 1) Our clients benefit from structure and need social interaction to be integrated into functional activities.
- 2) People with severe and multiple disabilities often don't have the ability to interact successfully with others on their own. Our clients need support and instruction to access their environment and have purposeful experiences.
- 3) We can set the scene for peer interaction by changing the space (how would the clients be positioned if they had no disabilities?), offering speech-generating devices, and evaluating the composition of group (which peers seem to like each other?).
- 4) We can help them interact naturally (prompting social behavior when positioned near each other and not getting in the way of peers communicating).
- 5) Positive feedback is powerful for gaining and maintaining skills. If they are communicating, tell them they are doing it and that you're proud of them!
- 6) Nurses/PT/OT/etc. can help with positioning ideas, too. Anyone can give ideas!
- 7) Position clients...

- Within 3 ft of one another,
- Facing each other,
- Provide speech-generating devices (switches that can be recorded with speech)



APPENDIX G

STAFF ORIENTATION FIDELITY CHECKLIST

Staff Orientation Fidelity Checklist

- _____ Read script to staff member(s).
- _____ Direct staff member's attention to the positioning of client(s) in the study.
- _____ Show proper SGD for each client and give demonstration of message.
- _____ Observe return demonstration of SGD activation if staff member states they are not familiar with SGD.

APPENDIX H
STAFF ORIENTATION SCRIPT

Staff Orientation Script

Our clients can't always interact successfully with others on their own. They need support to access their environment and have meaningful experiences.

Socialization should be a part of their activities when they are in and out of their wheelchairs.

We can help them interact by changing the space between them (think: How would the clients be positioned if they had no disabilities and were sitting together taking a break from their work?), offering speech-generating devices (think: What would they like to say to each other), and having them with their friends or people we think they might get along with

We can help them with social interaction naturally by positioning them near each other and not getting in the way while they are communicating.

Giving them positive feedback is powerful for gaining and maintaining skills. If they are communicating, tell them they are doing it!

Lastly, put SGDs back if they fall, help the clients back into position if necessary, and don't put the clients in these positions unless I am in the room for now.

Position clients...

- Within 3 ft of one another,
- Facing each other,
- Provide speech-generating devices (switches that can be recorded with speech) and record a meaningful or motivating message for them.
- Check the client's position and SGD often to make sure they are in the original positions.

Specific positions, dyads, SGDs, and messages for each participant:

Participant	Position and SGD	Message
1) Calvin partnered with Betty	Stander with Cheap Talk 8 using either hand	Hi, What's up?, Let's chat, Look at me, Say something to me, Smile, Glad to see you, I like hanging out with you
2) Betty partnered with Calvin	Stander with LITTLE Step-By-Step with Levels using either hand	Hey, look at me!, How's it going?
3) John partnered with Kevin	Supine with slight lift under left side on wedge with LITTLE Step-By-Step with Levels with left hand	Hey, look at me!, How's it going?, It's great to hang out with you
4) Kevin partnered with JJM	Bouncing Chair with LITTLEmack with either hand	Hey, I'm having a great time here with you.
5) Dulcie partnered with Elise	Side lying on left with LITTLEmack with button switch for left head turn activation	What a great day, huh?, We get to hang out!
6) Elise partnered with Dulcie	Side lying on right with LITTLEmack with credit card switch for right hand activation	Hey, let's chat!
7) Adah partnered with a non-participant	Side lying on either side with LITTLEmack with button switch for either hand activation	Hey, it's good to hang out with you!, What's new?
8) Faith partnered with a non-participant	Seated in bean bag with LITTLE Step-By-Step with Levels with either hand	Hey, what a great day; Let's chat, Look over here
9) Hannah partnered with Irene	Side lying on right with LITTLE Step-By-Step with Levels with either hand	Woohoo!, Hey, girl, Let's chat, How's it going?
10) Irene partnered with Hannah	Prone over a wedge with LITTLEmack with right hand	Hey, look at me, Let's chat

APPENDIX I
TASK ANALYSIS OF SOCIAL POSITIONING WITH AND
WITHOUT TRAINING AND MAINTENANCE

Social Positioning Condition with and without Training and Maintenance

Procedural Checklist

- _____ Check with the classroom supervisor and/or nurse to determine if now is a good time to work with the individual(s).
- _____ Greet participants.
- _____ Position clients in the appropriate manner determined at the prescreening:
 - ___ no more than 3 ft from one another
 - ___ facing one another
 - ___ provide the SGDs deemed appropriate by the prescreening to participants
 - ___ orient each participant to his or her partner
 - ___ orient each participant to SGD
 - ___ activate SGD for participant as a model and to confirm functionality or have participant activate it
- _____ Set up cameras so each participant's eye gaze, vocalizations, SGD activations, and reaching can be observed clearly.
- _____ Read script to participants (**social positioning with training and maintenance**).
- _____ Videotape for 20 min at a time.
- _____ Offer intermittent and general positive reinforcement to the participant as would naturally occur (**offer intermittent, contingent verbal praise and feedback during social positioning with training and maintenance**).
- _____ Thank the participant(s).
- _____ Remove cameras and study SGDs.
- _____ Replace predetermined SGDs with classroom SGDs if possible.

APPENDIX J
PARTICIPANT TRAINING SCRIPT

Participant Script (Social positioning with training condition)

Hi! I'm so happy you can hang out together today. Let's talk about what we can do when we are near other people that can help us talk to each other.

1. We can reach for our friends to shake hands, hi five, or give them a pat. Or we can just try to do that even if we can't quite make it. **SHOW EXAMPLES AND FACILITATE RETURN DEMONSTRATION 1X.**

2. We can look at our friends so they know we are listening or so they know we want to say something to them. **SHOW EXAMPLES AND FACILITATE RETURN DEMONSTRATION 1X.**

3. We can use our voices to speak to our friends or answer them. **SHOW EXAMPLES AND FACILITATE RETURN DEMONSTRATION 1X.**

4. We can use our communication devices to talk to our friends or answer them. **MODIFIED AIDED LANGUAGE STIMULATION PROCEDURES – POINT TO DEVICE AND NAME THE MESSAGES FOR EACH MESSAGE FOR EACH PARTICIPANT. GIVE EXAMPLES OF HOW THEY CAN MAKE EYE CONTACT, VOCALIZE, REACH, OR ACTIVATE SGD IN RESPONSE TO SGD. FACILITATE RETURN DEMONSTRATION 1X.**

Participant	SGD Example
1) CMF partnered with BRB	CMF, you could say, "Say something to me." and BRB, you could say, "How's it going?"
2) JJM partnered with KGF	JJM, you could say, "How's it going?" and KGF, you could say, "It's great to hang out with you."
3) ESE partnered with DLU	ESE, you could say, "Hey, let's chat!" and DLU, you could say, "What a great day, huh? We get to hang out!"
4) AJW partnered with a non-participant	AJW, you could say, "Hey, it's good to hang out with you!, What's new?" and non-participant partner, you could say, "Hey, it's great to hang out with you."
5) FSS partnered with a non-participant	FSS, you could say, "Hey, what a great day!" and non-participant partner, you could say, "Hey, it's great to hang out with you."
6) ICA partnered with HVG	ICA, you could say, "Let's chat." and HVG, you could say, "Woohoo!"

Now I want to see you guys chat with each other (not so much the staff unless you need help – you can always talk to them later). That's what this whole study has been about. Good luck! I know you'll do awesome.

APPENDIX K
SOCIAL VALIDITY SURVEY

*Please fill out all questions. If you are uncomfortable filling out a question, you may leave it blank. Your survey is anonymous.

- 1) What is your age? _____
- 2) What is your gender (or what gender do you identify with)? _____
- 3) What is your race/ethnicity? _____
- 4) How many years have you worked at Marklund? _____
- 5) Are you a certified teacher? _____
- 6) What is your job title? _____
- 7) Have you received any training on how to position the clients for communication or socialization? _____
- 8) If yes, what did you think of the training you received? _____
- 9) Have you received any training on speech-generating devices? _____
- 10) If yes, what did you think of the training your received? _____

**Refer to these pictures and their descriptions to help you answer some of the questions that follow. Read each question carefully. Please note that some questions are stated as I DO NOT.*



There are many types of communication devices which are also called speech-generating devices (SGDs). The ones pictured above are just a few examples that may hold one message up to several messages.



The speech-generating device above holds many messages and can be considered a more complex speech-generating device.

11) I am familiar with most of the clients.

Strongly Disagree Disagree No opinion Agree Strongly Agree

12) I have positive feelings about the clients.

Strongly Disagree Disagree No opinion Agree Strongly Agree

13) I feel comfortable helping the clients communicate with others.

Strongly Disagree Disagree No opinion Agree Strongly Agree

14) I often **DO NOT** understand what our clients are trying to communicate.

Strongly Disagree Disagree No opinion Agree Strongly Agree

15) I believe that the clients have the right to communicate with anyone they want to communicate with.

Strongly Disagree Disagree No opinion Agree Strongly Agree

16) I **DO NOT** like when the clients have a speech-generating device.

Strongly Disagree Disagree No opinion Agree Strongly Agree

17) When the clients have speech-generating devices, it makes my job harder.

Strongly Disagree Disagree No opinion Agree Strongly Agree

18) I understand the clients better when they use a speech-generating device.

Strongly Disagree Disagree No opinion Agree Strongly Agree

19) I need more training on how to use the complex speech-generating devices the clients use.

Strongly Disagree Disagree No opinion Agree Strongly Agree

20) I need more training on how to use the speech-generating devices the clients use that have one or only a few messages.

Strongly Disagree Disagree No opinion Agree Strongly Agree

21) I **DO NOT** need more training on how each client communicates.

Strongly Disagree Disagree No opinion Agree Strongly Agree

22) The clients need more training on how to use the more complex speech-generating devices.

Strongly Disagree Disagree No opinion Agree Strongly Agree

23) The clients communicate with staff members most often.

Strongly Disagree Disagree No opinion Agree Strongly Agree

24) Our clients **DO NOT** have opportunities to communicate with each other often.

Strongly Disagree Disagree No opinion Agree Strongly Agree

25) I do most of the "talking" when communicating with our clients.

Strongly Disagree Disagree No opinion Agree Strongly Agree

26) I have a hard time waiting for clients to respond to my questions.

Strongly Disagree Disagree No opinion Agree Strongly Agree

27) I generally ask the clients questions that require *yes* and *no* responses.

Strongly Disagree Disagree No opinion Agree Strongly Agree

28) **I think it's important for the clients to socialize even when they are out of their wheelchairs.**

Strongly Disagree Disagree No opinion Agree Strongly Agree

29) **Out-of-wheelchair time is for pressure relief and relaxation only.**

Strongly Disagree Disagree No opinion Agree Strongly Agree

30) **I often position clients in ways that are convenient for me.**

Strongly Disagree Disagree No opinion Agree Strongly Agree

31) **I DO NOT know what to do for the clients when they are out of their wheelchairs when it comes to communication and socialization.**

Strongly Disagree Disagree No opinion Agree Strongly Agree

32) **I offer speech-generating devices to most clients regularly when they are in their wheelchairs.**

Strongly Disagree Disagree No opinion Agree Strongly Agree

33) **I offer speech generating-devices to most clients regularly when they are out of their wheelchairs.**

Strongly Disagree Disagree No opinion Agree Strongly Agree

34) **How do you feel about being asked to position the clients so that they can socialize with each other when they are out of their wheelchairs?**

35) **Do you have any other ideas that could help the clients communicate with each other when they are out of their wheelchair.**

APPENDIX L
SOCIAL VALIDITY DEMOGRAPHIC DATA

Results of Pre-intervention Survey Demographic Data

Age	Gender		Race/ Ethnicity		Years Employed with Current Company		Job Title		Certified Teacher?	Positioning Training	SGD Training				
20-24	6	Female	17	Caucasian	12	Less than 1 year	8	CNA/TA A	19	Yes	0	Yes	8	Yes	10
25-29	7	Male	3	Hispanic	7	1-3 years	5	DI	1	No	19	No	12	No	10
30-34	2			Asian	1	4-9 years	5			No	1				
35-39	3			African American	0	10+ years	2			Answer					
40+	1														
No Answer	1														

Results of Post-intervention Survey Demographic Data

Age	Gender		Race/ Ethnicity		Years Employed with Current Company		Job Title		Certified Teacher?	Positioning Training	SGD Training				
20-24	6	Female	15	Caucasian	8	Less than 1 year	7	CNA/TA A	16	Yes	0	Yes	14	Yes	11
25-29	5	Male	2	Hispanic	9	1-3 years	6	DI	1	No	17	No	3	No	6
30-34	1			Asian	0	4-9 years	3			No	0				
35-39	3			African American	0	10+ years	1			Answer					
40+	2														
No Answer	0														