EFFECT OF AN AAC APP-BASED VIDEO TRAINING ON PEERS' ACCURACY IDENTIFYING COMMUNICATIVE BEHAVIORS IN PRESYMBOLIC MIDDLE SCHOOLERS WITH MULTIPLE DISABILITIES

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ABSTRACT

Consistent partner responsivity builds the associations that bring about the start of symbolic communication in language development. Middle-school students with multiple disabilities who have not yet transitioned to the symbolic stage of language development likely encounter varying responses to their presymbolic communicative behavior from the different communication partners with whom they interact throughout the day (e.g., teachers, parents, peers), resulting in a major barrier to their language development. In an initial attempt to address this barrier, the current study evaluated the impact of a peer partner training on those peers’ performance discriminating between specific communicative behaviors and non-communicative behaviors performed by three middle schoolers with multiple disabilities and displayed through video. The study used a pretest-posttest control group design to determine any effects of the training. Comparing gain scores across the experimental and control groups indicated the training was effective ($F=78.907, p < .001$). Trainings featuring video, practice, and feedback may be an effective way to promote consistency in the ways in which communication partners, such as peers, are interpreting the behaviors of individuals with multiple disabilities who are presymbolic. Interpreting such behaviors consistently is a necessary precursor to responding to the behaviors consistently. Responding to behaviors consistently, in turn, may support the development of conventional, symbolic language. Future research should build upon this initial step by evaluating trainings focused on teaching both identification of and responsivity to the communicative behaviors of school-aged and older individuals with multiple disabilities within the evaluative context of face-to-face interactions between partners and those individuals.
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CHAPTER ONE

Introduction and Review of the Literature

Typical Early Communication and Language Development

Communication (i.e., behavior that conveys information to others) and language (i.e., the use of symbolic conventions to communicate) blossom in the first year of life for individuals who are typically developing. Although both continue to develop throughout the lifespan, important developments typically happen within this first year.

Preintentional communication is present from birth and is the first stage of communication development. Also referred to as the perlocutionary stage of communication (Bates, Camaioni, & Volterra, 1975; Iacono, Carter, & Hook, 1998), it includes behaviors produced by an individual which convey meaning without the goal of conveying meaning (Iacono et al., 1998). For instance, a young child might cry when she is uncomfortable. The child is not crying with the goal of a communication partner hearing the cry and alleviating the discomfort. Rather, she is crying as a reaction to her state of discomfort. However, a parent is likely to hear her crying, interpret it to mean she is uncomfortable, and act accordingly. As development continues, intentional behavior emerges early. Intentional behaviors include acts produced volitionally with a goal. However, that goal may not necessarily be communicative. For instance, the child may turn her head to view something of interest in her environment. This developmental transition does not, strictly speaking, mark a new stage of language development. This is because intentional behavior without a communicative goal is still classified as preintentional communication; the child is still not communicating intentionally.

This begins to change around 9 months of age. Here, intentional communication typically begins, marking a new stage in communication development (Carter & Iacono, 2002; Warren &
Yoder, 1998). In this stage, also referred to as the illocutionary stage (Bates et al., 1975; Iacono et al., 1998), the child behaves with the goal of conveying meaning to a communication partner. For example, she may push food off her tray to communicate to her mother she does not care to eat it. It is impossible to know with certainty when communication becomes intentional rather than preintentional, as a person’s intent can only be gleaned from his/her behavior and any information inferred is mere conjecture. However, the distinction is typically made by the presence of coordinated attention (Iacano et al., 1998; Sugarman, 1984). When coordinated attention is demonstrated, “the child focuses not only on the object of desire, but co-ordinates attention that shifts between the object and the adult” (Iacono et al., 1998, p. 102). Does she look toward a communication partner, look toward the referent, and look back toward the communication partner? When coordinated attention is displayed, communicative behavior is generally assumed to be intentional (Iacono et al., 1998; Sugarman, 1984).

Whether preintentional or intentional, communication up to this point has been presymbolic. That is, the child has communicated without any use of symbols (e.g., words). Instead, she has used behaviors including vocalizations (e.g., crying), facial expressions (e.g., smiling), gestures (e.g., reaching), and eye gaze (e.g., looking toward something she wanted). At times, she used these behaviors in combination.

All these changes have laid the foundation for the emergence of language, marked by a transition into symbolic (or locutionary; Bates et al., 1975; Iacono et al., 1998) communication. This stage typically begins around 12 months of age with the emergence of first words. Now the child says “Mama!” when she sees her mother rather than just reaching toward her and vocalizing.
Communication Partners and Typical Early Language Development

More expert communication partners, largely parents or guardians, scaffold each transition through these stages. Communication partners scaffold more and more sophisticated communicative behaviors by responding to the communicative behavior that comes before it. This responsivity is critical to language development (Carter & Iacono, 2002; Grove, Bunning, Porter, & Olsson, 1999). Responses are usually two-pronged. The first prong of responsivity is a behavioral component. For instance, in response to the child reaching for her plate, her mother might scoop another bite for her to eat. The second prong is a linguistic component. This prong imprints a “linguistic map” onto a referent or concept (Carter & Iacono, 2002; Yoder, Warren, Kim, & Gazdag, 1994). For instance, in response to the child reaching for her plate, her mother would likely also respond by saying “Oh! You’re hungry!”

In the development of intentional behavior, responses help build cause-and-effect and an understanding of self as an influencer of the environment (Bates et al., 1975; Iacono et al., 1998). In the development of intentional communication, responses help build an understanding of self as an influencer over the behavior of others in the environment. The first prong of responsivity (i.e., the behavioral component) plays a large role during these developmental transitions.

In the development of symbolic communication, responses provide the symbols (i.e., words) typically developing young children learn to associate with a referent. Therefore, when scaffolding transitions to this symbolic stage, the second prong of responsivity, linguistic mapping, is particularly important.

The theoretical importance of parent/guardian responsivity in language development is clear. However, this clarity extends beyond theory. In fact, “there is a substantial and growing body of evidence that cumulative exposure to a stable, highly responsive parenting style
throughout the early childhood period is associated with a variety of child benefits in terms of language, cognitive, emotional, and social development” (Warren & Brady, 2007, p. 330).

Young Children with Intellectual and Developmental Disabilities

Not all children develop language at the same pace. There are a variety of intrinsic (i.e., internal) and extrinsic (i.e., external) factors influencing rate and ease of language acquisition for any young child. These factors both can impact language development in young children with intellectual and developmental disabilities. Young children with intellectual and developmental disabilities (e.g., Down syndrome, autism spectrum disorder, fetal alcohol spectrum disorder) are at risk for limitations in communication and language development. Depending on their disability and environment, they may acquire language along a timeline reflective of typical development. Alternatively, their communication and language development might follow a more extended timeline.

Communication Partners and Young Children with Intellectual and Developmental Disabilities who are Presymbolic Communicators

Applying lessons from typical language development, researchers have made a concerted effort to explore the role of parental responsivity in the development of young children with intellectual and developmental disabilities. Multiple studies have used longitudinal methodology to evaluate the role of maternal responsivity in language development for young children with intellectual and developmental disabilities. In one example, Yoder and Warren (1999) followed a group of young children with intellectual and developmental disabilities and their mothers over a year’s time. In another, Warren, Brady, Sterling, Fleming, and Marquis (2010) followed a group of young children with fragile X syndrome for three years. Consistent with early language development theory, results from research in this area overwhelmingly indicate maternal
responsivity contributes significantly to later language development (Brady, Warren, & Sterling, 2009). In fact, maternal responsivity sustained over the early years of life predicted receptive and expressive vocabulary outcomes in children with fragile X syndrome, even well into the school-aged years (Brady, Warren, Fleming, Keller, & Sterling, 2014).

**Intervention for Young Children with Intellectual and Developmental Disabilities who are Presymbolic Communicators**

**Prelinguistic Intervention.** Given the important role parental responsivity plays in communication and language outcomes for children with intellectual and developmental disabilities, it is important to consider interventions focused on increasing parental responsivity. In 2002, Yoder and Warren evaluated a parent- and child-directed intervention with young children with intellectual and developmental disabilities and their parents and found it to be effective in increasing parental responsivity. Fey and colleagues (2006) found an intervention involving parent education and child-directed therapy with their young children with intellectual and developmental disabilities to have a positive impact on the communication of the children and increase responsivity for some of the parents. However, Warren, Fey, Finestack, Brady, Bredin-Oja, and Flemming (2008) did not find an impact of this treatment six-months or a year after its conclusion.

**Linguistic intervention.** Alternatively, some researchers have focused on intervention for young children with developmental disabilities that introduced symbolic communication through augmentative and alternative communication (AAC). AAC intervention includes instruction and technology providing access to a communication modality other than speech (Beukelman & Mirenda, 2013). Unaided AAC involves options such as gestures and/or sign language which require nothing external to the user to communicate, while aided AAC involves
external communication modalities, such as a communication book filled with familiar symbols, or a tablet housing an AAC app for communication (Beukelman & Mirenda, 2013).

Early symbolic AAC interventions for young children with intellectual and developmental disabilities are beneficial (Romski, Sevcik, Barton-Husley, & Whitmore, 2015). Benefits for both communication (e.g., initiations; Dicarlo & Banajee, 2000), and language (e.g., vocabulary growth; Wright, Kaiser, Reikowsky, & Roberts, 2013) have been documented. Strategies for effective linguistic AAC intervention for young children with intellectual and developmental disabilities have included partner instruction in modeling use of aided AAC devices (e.g., Sevcik, Romski, & Adamson, 2004), partner instruction in the use of naturalistic communication support strategies (Nunes & Hanline, 2007), natural immersion of multimodal AAC intervention into play and learning environments (van der Schuit, Segers, van Balkom, Stoep, & Verhoeven, 2010), and teaching through interactive computer software (Hetzroni & Belfiore, 2000).

School-aged and Older Individuals with Multiple Disabilities who are Presymbolic Communicators

The Individuals with Disabilities Education Act (IDEA) defines multiple disabilities as “concomitant (simultaneous) impairments (such as mental retardation-blindness, mental retardation-orthopedic impairment, etc.), the combination of which causes such severe educational needs that they cannot be accommodated in a special education program solely for one of the impairments.” For example, a student who has Down syndrome and low vision, but whose vision is corrected with glasses and requires services relative only to his or her cognitive impairment, would not meet the IDEA definition of multiple disabilities. Conversely, a student who is in a wheelchair due to a physical disability, has a cognitive impairment, and is blind
would meet the IDEA definition of multiple disabilities as that student would require services for multiple impairments in order to successfully access the curriculum (e.g., he or she would likely receive support from a physical therapist, a vision specialist, and a speech-language pathologist, among other specialists). The definition excludes only those individuals who experience both deafness and blindness who receive their own classification of “deaf-blindness.” Before and outside the IDEA classification, individuals with multiple disabilities (MD) have also commonly been referred to as individuals with “multiple and severe disabilities,” “severe disabilities,” “profound disabilities,” “severe and profound intellectual disabilities” or other classifications indicating the large impact multiple disabilities can have on life and functioning.

The language and communication profiles of individuals with MD varies from person to person. Such variance likely results from a variety of intrinsic (e.g., extent to which mobility is limited, extent to which working memory is limited) and extrinsic (e.g., access to appropriate services, presence of strong advocates) factors. Some individuals with MD are beginning communicators beyond the first year of life. In fact, some of these individuals persist into school-age and adulthood presenting within the beginning stages of language and communication development.

School-aged individuals with MD, regardless of their communication and language profiles, are not infants. By this time, they have had a multitude of experiences no infant has encountered. They have also experienced development in a variety of sectors infants have yet to experience. Their daily lives are unlike that of infants. Their thoughts, wants, and needs, too, are unique. It may, therefore, be a questionable venture to apply frameworks of typical early language development to the language development of this group. However, there is no existing framework specific to the beginning stages of language development for school-aged and older
individuals with multiple disabilities. In the absence of such a framework, applying lessons from
typical early language development may be the most useful approach to understanding and
scaffolding their development in a theoretically-valid manner (Paul, 1997). Of course, it is
impossible to know the extent of the utility of such an application, but “the point is to take
suggestions from typical development, test them, and learn from the experiment” (Paul, 1997, p.,
143).

Following typical development, the communication and language profiles of school-aged
individuals with MD can be classified as preintentional, presymbolic intentional, and early
symbolic. Early symbolic communicators with MD use a small corpus of symbols to
communicate. While in typical development, this translates to a handful of spoken words, as it
manifests in school-aged individuals with MD, this could translate to a small number of spoken
words, signs, aided AAC symbols, or any combination thereof. Early symbolic communicators
of any age also continue to rely heavily on presymbolic modes of communication (e.g., gestures,
facial expressions) to supplement their symbolic communication.

The presence or absence of symbol use makes the distinction between early symbolic and
presymbolic communication in school-aged individuals with MD a straightforward one. The
same cannot be said for the distinction between preintentional communication and intentional
communication. In traditional language development, this difference is marked by the presence
or absence of coordinated attention (Iacono et al., 1998; Sugarman, 1984). However, this signal
becomes less useful when discerning between preintentional and intentional communication in
individuals with MD as many individuals with MD may not be able to produce the eye gaze
behaviors indicative of coordinated attention (Iacono et al., 1998). Iacono and colleagues (1998)
found traditional definitions of intentional communication, including those outlined by
Whetherby and Prizant (1989) found problematic when assigning intentionality to the communication of three elementary-aged students with MD. Despite finding relatively high rates of communicative behavior, very little of that behavior met traditional thresholds of intentionality.

Bruce and Vargas (2007) piloted a new coding scheme for identifying intentional communicative behavior in children with MD, some of whom were school aged. The coding scheme involved nine characteristics of intentional behavior. Two of these characteristics were used to define which behaviors were intentional; both were essential to the coding of intentional communication. The authors explored the rates at which the remaining seven features occurred during these intentionally communicative behaviors, but these seven characteristics were not used to define communicative behavior as intentional. The essential characteristics were as follows:

1. Child deliberately attempts to establish, establishes joint attention, or responds to communication partner’s attempt to establish joint attention by (a) mutual eye gaze, (b) gesture, (c) leaning toward, (d) touch, or (e) specific vocalization or verbalization (e.g., calling to an adult at a distance.) In some cases, joint attention was also established over an object or activity. (e.g., Sierra displayed joint attention by leaning forward, toward her communication partner).

2. Child expresses message in a non-conventional form or conventional form that is recognized by communication partner and/or others (including the researcher). For example, Tyler used the conventional gesture of pointing to indicate direction (p. 305).

With these definitions, the children in the study demonstrated relatively high rates of intentional, communicative behavior. This finding contrasts with previous studies with school-aged and adult individuals evaluating levels of intentional communication using traditional
definitions (Iacono et al., 1998). This suggests the characteristics outlined by Bruce and Vargas (2007) may be more useful when identifying intentional communicative behavior in school-aged individuals with MD.

Some researchers have argued discriminating between preintentional and intentional communication in individuals with MD who are presymbolic communicators may have limited clinical relevance (Sigafoos et al., 2000). Regardless, whether identifying preintentional communication with the goal of scaffolding the transition to intentional presymbolic communication or identifying intentional presymbolic communication with the goal of scaffolding the transition to symbolic communication, responsivity is crucial (Grove et al., 1999; Iacono et al., 1998). Therefore, if both preintentional and intentional presymbolic communicative behaviors are met with two-pronged responses, it may not matter which prong might be particularly influential for any given behavior. Whether intentional or not, the communicative behavior of individuals with MD should be met with a “guarantee of relevance” (Sperber & Wilson, 1986, from Grove et al., 1999, p. 166). After all, “if we [communication partners] do not act ‘as if’ there is a potential for communication, there will not be any communication to discuss” (Grove et al., 1999, p. 200).

Intentionality aside, the presymbolic communication of school-aged and older individuals with MD has been classified descriptively. These descriptive classifications identify the presymbolic communicative behaviors of the individuals with MD which are idiosyncratic, or unique to them, and organize them systematically. Different researchers have used different systems of classification. For instance, as part of their larger study to identify intentional communication in school-aged individuals with multiple disabilities, Iacono and colleagues (1998) also classified the communicative behavior of the participants as either: vocalizations,
gestures, eye gaze, smiles, or other. Ogletree, Bartholomew, Wagaman, Genz, and Reisinger (2012) organized communicative behaviors from adults with multiple disabilities reported to be preintentional behaviors into one of five categories:

1. Facial orienting +/- Vocalization: positioning one’s face toward a partner or object, with or without a vocal sound (see #2)
2. Vocalizing: producing a vocal sound, including laughter and raspberries, toward a person or object
3. Physical action: performing head/extremity movements, body posturing, and/or facial expressions toward a person or object, including object manipulation
4. Physical action + Vocalization: performing head/extremity movements, body posturing, and/or facial expressions toward a person or object, including object manipulation, with a vocal sound (see #2) (p. 57).

In the case of both studies, participants with MD used behaviors falling within each of the assigned categories. Gestures occurred with a relatively high level of frequency in each participant in Iacono and colleagues’ (1998) study. Similarly, Ogletree and colleagues (2012) found physical action to occur most frequently for each of their four participants.

Communication Partners and School-aged and Older Individuals with MD who are Presymbolic Communicators

Weighing lessons from typical early language development, it is likely that communication partners play an important role in the communication and language development for school-aged and older individuals with MD who are presymbolic communicators. Applying the stages of early language development (i.e., preintentional; intentional presymbolic, early symbolic) to organize the communication and language profile of a school-aged individual with
MD provides information about what particular partner behaviors might be most valuable in promoting language growth at any given stage. As outlined in the description of early language development, linguistic mapping may be particularly important in supporting the transition from intentional presymbolic communication to early symbolic communication. Behavioral responses from the partner are important in all instances for a variety of reasons (e.g., quality of life), but may play a larger role than linguistic mapping in scaffolding preintentional communication into intentional communication (Yoder et al., 2001).

However, the structure of communication partners in the lives of school-aged and older individuals with multiple disabilities differs from the structure of the lives of young children in one important – and consequential – way. The first year of life, when typical early language development occurs, is overwhelmingly spent with one or two communication partners (i.e., a parent/guardian or parents/guardians). These partners are typically highly attuned to the behaviors of the young child, and are therefore equipped to be highly responsive (Yoder & Feagans, 1988). In typical development, then, communicative behavior is received at high levels of frequency with responses that are highly consistent. Consistent responsivity to preintentional behaviors allows these early language learners to build intent, to see themselves as communicators, and to learn the concepts associated with behaviors. Consistent responsivity to presymbolic intentional communicative behaviors, including consistent linguistic mapping, allows early language learners to construct an internal symbol and associate it with the concept it represents.

In contrast, school-aged and older individuals with MD interact with a number of communication partners throughout their day or week. For instance, a high schooler with MD may interact primarily with a nurse who supports his getting ready for school in the morning, a
variety of partners throughout the school day (e.g., special education teachers, administrators, general education teachers, speech-language pathologists, occupational therapists, physical therapists, vision specialists, hearing specialists, paraprofessionals, classmates, and other peers), different members of the community in his afterschool activities, and his parents and siblings at home in the evening.

For many reasons (e.g., social development, quality of life), school-aged and older individuals frequently interacting with individuals other than their parents is a positive aspect of their lives. Yet, this difference creates a unique problem: less familiar communication partners (e.g., non-family members) may be responding to the presymbolic communicative behavior of these individuals with limited frequency and consistency.

When these less familiar partners do respond consistently to a presymbolic communicative behavior, their response may be based on an interpretation entirely different from the interpretation made by highly familiar partners (e.g., parents). Carter and Iacono (2002) gathered judgments about the intentionality of behavior produced by three children with multiple disabilities, two children with Down syndrome, and a child without a disability. Judgments were provided by 20 special education teachers and 19 speech-language pathologists. Findings demonstrated large in-group variance in judgments, and a tendency for speech-language pathologists to be less likely to ascribe intentionality to behavior. Wilcox, Kouri, and Caswell (1990), too, found variation within groups of teachers, speech-language pathologists, and mothers relative to their judgments of intentionality in children with disabilities.

Given that communication partners are not agreeing on whether communication is intentional, it seems unlikely communication partners are agreeing about the specific intent behind intentional communication. It seems even less likely still, that communication partners
are choosing the same linguistic maps to assign to the specific intent they have interpreted behind communicative behaviors.

**Intervention for School-aged and Older Individuals with MD who are Presymbolic Communicators**

*Linguistic.* Although less common than interventions for their younger counterparts, interventions for individuals with MD who communicated mostly through presymbolic means and were at the school age or older can be found in the literature. These interventions introduce AAC as an expressive modality for the individual with MD. Romski and Sevcik (1996) implemented a program of modeling AAC to a group of school-aged individuals with intellectual and developmental disabilities, including some students with multiple disabilities who demonstrated an emerging use of symbolic communication but communicated largely through presymbolic means. The intervention “included five components: 1) a speech-output communication systems; 2) an appropriate arbitrary [abstract] symbol vocabulary; 3) naturalistic communicative experiences during which the youth was encouraged, but not required, to communicate; 4) partners (teachers, parents, and siblings) who were taught how to use the device and how to provide both a symbol model and input via speech + symbols to the youth; and 5) investigators provided a resource and feedback mechanism to monitor progress across the study” (Romski & Sevcik, 1997, p. 366). Results indicated a positive impact on the communication of participants.

Holyfield, Caron, Drager, and Light (2017) completed an intervention involving five participants, four of whom were high schoolers with multiple disabilities who demonstrated emerging symbolic communication, and of these, three of whom communicated mostly through presymbolic communicative behavior. The intervention introduced an AAC app on mobile
technology featuring visual scene displays and the use of just-in-time programming. All of the participants with MD demonstrated an increase in communication turns as a result of the intervention, suggesting the technology and the use of just-in-time programming may allow for an accessible aided AAC option for these individuals.

**Prelinguistic.** AAC intervention research focused on prelinguistic communication in school-aged and older individuals with MD is limited. Lessons from typical early language development and from research with younger individuals with intellectual and developmental disability may be applied to discern those foci of intervention likely to be most pertinent. These sources of information would suggest communication partner responsivity to be an important focus of intervention. This suggestion would be corroborated by descriptive research illustrating a lack of consistency in communication partner interpretation of the intentionality of behaviors from school-aged and older individuals with MD (Carter & Iacono, 2002; Wilcox et al., 1990). One logical focus of intervention with this group, then, may be to intervene directly with individuals with MD with an emphasis on increasing intentional communication. This intervention may, for instance, scaffold participants’ attention toward communication partners and toward referents with the goal of building intentional communication. Such an intervention may be valuable for a couple of reasons.

First, “the frequency of prelinguistic [presymbolic] intentional communication predicts later language levels in children with disabilities… intentional communication may directly or indirectly influence later receptive and/or expressive language” (Yoder & Warren, 2001a, p.224). This finding has been replicated across multiple studies (e.g., Mundy, Kasari, Sigman, & Ruskin, 1995; Yoder & Warren, 2001b).
Second, in the case of young children with disabilities, it seems intentional communication is more effective in garnering parental responses than is preintentional communication (Yoder & Warren, 1993; Yoder & Warren, 2001b). This may be due to the more obvious and straight-forward nature of these communicative attempts, and their greater likelihood of resembling conventional communication than their preintentional counterparts. Further, in a study with young children with developmental disabilities or delays and their primary care providers, Yoder, McCathren, Warren, & Watson (2001) found care provider responses to intentional communication were predictive of later language and communication development while responses to preintentional communication were not. Therefore, not only are intentional communicative behaviors more likely to elicit a response, but responses to intentional communication may be more fostering of development.

Promoting intentional communication seems likely to result in more frequent and consistent responses for school-aged individuals with MD from their communication partners. These responses, in turn, seem likely to promote communication and language development for individuals with MD. However, this logic also be applied in reverse order: promoting responses from communication partners (e.g., through partner trainings such as those completed with the parents of young children; Fey et al., 2006) could facilitate an increase in intentional communication in individuals with MD. This increase would likely facilitate even more communication partner responses, thus creating a cycle supportive of communication and later language development.

**Partner-Focused AAC Interventions**

A recent meta-analysis by Kent-Walsh, Murza, Malani, and Binger (2015) found 17 studies of AAC intervention using partner training. The following instructional activities have
been used, alone or in combination, to train communication partners in AAC research: a descriptive overview, modeling, verbal practice, guided practice, role play, and written material instruction. The studies targeted, alone or in combination, the following communication partner skills: aided AAC modeling, expectant delay, open-ended question asking, general environmental arrangement, generally described provision of communication opportunities, generally referenced partner interaction training, prompting, manding, and contingent responding.

Results from the meta-analysis indicated that including all instructional activities into communication partner intervention is most effective. The study also found using aided AAC with voice output was more effective than using aided AAC without voice output. Further, partner AAC interventions had a subsequent positive impact on the individuals who required AAC across all age ranges except adolescence (12 – 17 years old) – an age range for which there was just one participant for whom no effect was detected.

**Peer Interactions and Their Importance**

Peers may be a particularly consequential group of communication partners. As students get older they spend more and more time with peers as their source of social interaction (Carter & Hughes, 2005). Additionally, social relationships play an important role in multiple aspects of development (Hartup, 1989; Therrien, Light, & Pope, 2016). Additionally, peer interactions and the relationships that blossom from them support a higher quality of life (Bukowski, Motzoí, & Meyer, 2009; Therrien et al., 2016).

In addition to being important for everyone, peer interactions may be particularly consequential for middle schoolers with MD who are presymbolic communicators. An important foundation to language development is coordinated attention between a communication partner
and referent (however that attention may manifest itself behaviorally). Therefore, that peer relationships are major social relationships at this age may make them likely to support social development, and in turn language development.

Further, peer interaction can also be a highly motivating context for middle schoolers. Motivation is an important factor in all learning – including communication and language learning. Motivation may be a particularly large piece of the language development puzzle for middle school aged individuals with MD considering the years of interactions they may have experienced in which their communication was not detected or received no response (Paul, 1997). A high level of motivation may be necessary for these students to persist despite a history of limited success.

**Peer Interventions and School-aged Individuals with Multiple Disabilities**

Despite the value of peer interactions, Kent-Walsh and colleagues’ (2015) meta-analysis found just six partner training studies that included even one peer participant (Cartell & Maxwell, 1998; Chung & Carter, 2013; Dattilo & Light, 1993; Garrison-Harrell, Kamps, & Kravits, 1997; Hunt, Alwell, & Goetz, 1991; Trottier, Kamp, & Mirenda, 2011). One of these studies included a peer participant in the training (Dattilo & Light, 1993). One of the dyads included in the study was an adult woman with MD and her adult friend. The training the friend completed included a descriptive overview, modeling, guided practice, and role-play to teach partners to implement multiple individual skills when interacting with the adult with MD (Kent-Walsh et al., 2015). Dattilo and Light (1993) measured the impact of the training on the communicative turns of the woman with MD and found it to increase communicative turns.

Outside the field of AAC, behavioral researchers have implemented interventions to support interactions between school-aged individuals with intellectual and developmental
disabilities, including those with MD, and their peers. In addition to their social benefits, such interventions can support engagement within and access to curriculum in the general education setting (Carter, Cushing, Clark, & Kennedy, 2005; Carter, Sisco, Brown, Brickham, & Al-Khabbaz, 2008).

A review by Carter and Hughes (2005) identified 26 studies aimed at promoting interaction between adolescents with intellectual and developmental disabilities, including those with MD, and their peers. Three of these studies implemented a peer training. Haring and Breen (1992) implemented a peer social network intervention package with middle school peers. The intervention resulted in an increase in quantity and quality of interactions between peer participants and students with disabilities (Haring & Breen, 1992). Staub and Hunt (1993) implemented a social interaction and disability awareness training for middle school peers and found it to be effective in increasing peer initiations and expansions. The training also had a positive impact on the communicative behaviors of students with disabilities (Carter & Hughes, 2005). Finally, Martella, Marchand-Martella, Young, and Macfarlane (1995) implemented a social interaction peer training to support interactions between high school students with MD and their peer math tutors. The training resulted in an increase in specific praise statements and appropriate commands from the peers (Carter & Hughes, 2005). Peers also decreased their use of negative statements (Carter & Hughes, 2005). Additionally, as a result of the peer training, the students with MD demonstrated a decrease in challenging behaviors during interactions with their peer math tutors (Carter & Hughes, 2005).

**The Current Study**

Middle school is an important time for social development, and peer interactions make a significant contribution to that development (Carter & Hughes, 2005). For middle schoolers with
multiple disabilities who are presymbolic communicators, social development is also important for language development. Important, too, is consistent and frequent responsivity from communication partners. However, communication partners less familiar with the idiosyncratic, presymbolic communicative behaviors of middle schoolers with MD may fail to recognize behaviors as communicative or may interpret them differently from expert communication partners’ (e.g., parents’) interpretations.

The current study serves as an initial step in evaluating interventions to address this problem with the long-term goal of promoting communication and language development in presymbolic communicators with multiple disabilities. The independent variable in the current study was a peer training involving video exemplars of communicative and non-communicative behavior from three middle schoolers with MD and input and feedback from an investigator. The primary dependent variable in the current study was the number of behaviors correctly interpreted out of 18 trials. A secondary dependent variable explored was participants’ level of certainty in their interpretation of the behaviors. The primary question addressed in the current study was: What is the effect of a peer training on the number of behaviors from middle schoolers with MD correctly interpreted by typically-developing middle school peers? (Question #1). It was hypothesized the training would increase the peers’ accuracy in interpreting behaviors. The primary dependent variable was also analyzed through a more exploratory approach to further understand the results by addressing the following questions: (a) do results differ across the three students with MD? (Question #2), (b) is the training effective in teaching the interpretation of each of the six communicative behaviors? (Question #3), and (c) do results differ between communicative and non-communicative behaviors? (Question #4). It was hypothesized that: (a) results might be larger relative to students whose communication most
closely resembled conventional communication than those middle schoolers with MD whose communicative behaviors were more idiosyncratic, (b) the training would support the interpretation of each of the six communicative behaviors, and (c) results would be more pronounced for communicative rather than non-communicative behavior. Using data from the secondary dependent variable, the study also addressed: What is the effect of a peer training on the level of certainty with which typically-developing middle schoolers interpret the behaviors of middle schoolers with MD (Question #5)? Again, it was hypothesized that peers’ level of certainty would increase as a result of the training. Finally, the study asked: what is the social validity of the training based on professional and peer report (Question #6)?
CHAPTER TWO

Method

Design

The study used a pretest-posttest control group design (Campbell & Stanley, 1963; 1966). Prior to the start of the study, participants were randomly assigned to one of two groups: experimental or control condition. The study implemented repeated testing, measuring each participant’s performance at two time points. This design was chosen because of its strength in ensuring internal validity (Trochim, 2006). That is, the design establishes a strong causal relationship between the independent and dependent variables.

The study took place over 9 weeks. Over the 9-week period, participants assigned to the experimental condition were tested (pretest probe), participated in the training, and were tested again (posttest probe). Over that same 9-week period, participants assigned to the control condition were tested at the beginning (pretest probe) and were tested again (posttest probe). Testing occurred over either one or two sessions, depending on the timing of the session and participants’ schedules. However, for participants in the experimental group, the training and the posttest probe always occurred in the same session.

Students with Multiple Disabilities

The intervention provided training to participants on the communicative behavior of three students with multiple disabilities with whom they interacted on a weekly, or twice weekly, basis. Students with multiple disabilities and peer participants were recruited through the school in which they were enrolled. Prior to recruitment, approval for the study was obtained from the institutional review board of the investigator’s university. Informed consent was obtained from a guardian for all students with multiple disabilities and all participants.
The students with multiple disabilities were in middle school and were all enrolled in the same special education classroom. The students communicated through idiosyncratic means based on parent and professional report and observation. Two of the students (Alyse and Frankie) communicated only through presymbolic means. One student’s (Van’s) communication was predominately presymbolic, but did include the emerging use of idiosyncratic approximations of symbols (i.e., vocal approximations) that were produced frequently, but with limited consistency or discrimination. Though representing emerging symbolic communication, these behaviors were still idiosyncratic in nature. All three students were reported to demonstrate intentional communication, although Frankie and Alyse were reported to communicate with less consistent intentionality than Van. The Table 2-1 further describes the students with multiple disabilities.
Table 2-1: Characteristics of Students with Multiple Disabilities

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Alyse</th>
<th>Van</th>
<th>Frankie</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>12</td>
<td>13</td>
<td>15</td>
</tr>
<tr>
<td>Gender</td>
<td>Female</td>
<td>Male</td>
<td>Female</td>
</tr>
<tr>
<td>Interests</td>
<td>Physical humor, sound effects, listening to music, friends, family</td>
<td>Playing ball, listening to music, friends, family</td>
<td>Listening to music, dolls, friends, family</td>
</tr>
<tr>
<td>Language/Communication</td>
<td>Consistently displays &lt;5 communicative behaviors All communicative behaviors presymbolic Uses facial expressions, body movements, and vocalizations to communicate</td>
<td>Consistently displays &lt;20 communicative behaviors Communicates mostly through presymbolic behaviors, but demonstrates emerging use of symbolic communication Uses facial expressions, body movements, gestures, and vocal approximations to communicate</td>
<td>Consistently displays &lt;10 communicative behaviors All communicative behaviors presymbolic Uses body movements, vocalizations, and facial expressions to communicate</td>
</tr>
<tr>
<td>Motor</td>
<td>Non-ambulatory</td>
<td>Non-ambulatory</td>
<td>Non-ambulatory</td>
</tr>
<tr>
<td>Sensory</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vision</td>
<td>Reported within functional limits</td>
<td>Blind</td>
<td>Reported within functional limits</td>
</tr>
<tr>
<td>Hearing</td>
<td>Reported within functional limits</td>
<td>Reported within functional limits</td>
<td>Reported within functional limits</td>
</tr>
</tbody>
</table>

*Based on teacher report and observation
The investigator interviewed the teacher and a parent of each of the three students to learn more about their communication, with the goal of identifying communicative behaviors to teach peer participants. Following these interviews, the investigator compiled a list of all behaviors named and described independently by both the teacher and a parent. Including only those behaviors recognized by both the teacher and a parent increases the probability that the intended meaning was accurately identified – an important responsibility for researchers addressing communication in individuals who are presymbolic (Iacono et al., 1998). The linguistic map of each behavior was determined based on the most frequently-occurring language used to name the behavior both at home (based on parent report) and at school (based on use by school professionals during regularly occurring interactions with the students). In cases of discrepancy (e.g., parents use linguistic map “funny” and teachers use linguistic map “goofy”), parent terminology was given priority considering the large amount of time school-aged individuals spend communicating with their parents and the consistent role parents play in the lives of school-aged children.

Video was gathered over a span of several weeks throughout the school day for the three students during a variety of regularly occurring contexts. The investigator reviewed approximately 30 min of this video (10 min across 3 common contexts) for each student with MD and tallied the times each identified communicative behavior appeared. The top two most frequently demonstrated communicative behaviors by each participant served as the target communicative behaviors to be taught to peer communication partners in the current study. Table 2-2 provides the target communicative behaviors for each student, their linguistic map, and the operational definition of the behavior demonstrated for each communicative behavior.
Table 2-2: Communicative behaviors taught in the training

<table>
<thead>
<tr>
<th></th>
<th>Alyse</th>
<th>Van</th>
<th>Frankie</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Communicative Behavior #1</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Linguistic Map</td>
<td>“That’s funny.”</td>
<td>“Yes, I want it.”</td>
<td>“I want it.”</td>
</tr>
<tr>
<td>Operational Definition</td>
<td>• Smiles</td>
<td>• Moves head down</td>
<td>• Extends arm toward</td>
</tr>
<tr>
<td></td>
<td>• Moves hand/arm</td>
<td>• Hums</td>
<td>person/object</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Moves hand/fingers</td>
</tr>
<tr>
<td><strong>Communicative Behavior #2</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Linguistic Map</td>
<td>“I’m unhappy.”</td>
<td>“Ball”</td>
<td>“I don’t want it.”</td>
</tr>
<tr>
<td>Operational Definition</td>
<td>• Moves eyebrows down and together</td>
<td>• Vocalizes a sound that starts with a “buh”</td>
<td>• Extends arm with palm out to push</td>
</tr>
<tr>
<td></td>
<td>• Moves hand/arm</td>
<td></td>
<td>person/object</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>away</td>
</tr>
</tbody>
</table>

**Participants**

In order to determine the number of participants to include in the study, a power analysis was completed based on pilot data from two graduate students in speech-language pathology. Based on the pilot data, a power analysis revealed that 9 to 10 participants in each group (18 to 20 participants in total) would provide adequate power to detect any effects from the training.

Prior to their participation in the study, assent (written and/or oral) was obtained from all participants in addition to the informed consent provided by their guardians. Twenty-four typically-developing middle school students participated in the current study. The students were enrolled in grades 6, 7, and 8, and were between the ages of 11 and 14. All of the students were enrolled in a voluntary school program in which they interacted with students in a special
education classroom, including the three students with multiple disabilities whose communication was the focus of the training. Peers were eligible to participate in the study based on their enrollment in that school program. Upon assenting to participate, participants completed a short demographic interview about their age, grade, history with each of the three students with multiple disabilities, history with the school program in which they interacted with students with disabilities, and whether or not they had a family member or close friend who had difficulty communicating. Table 2-3 outlines participants’ responses from the interview. Participants’ mean age was 12.4 years old. Most participants were 6th graders, with the mean grade being 6.8. Most participants did not have a family member or close friend who had difficulty communicating. Most participants had been enrolled in the program for less than one year. Most participants did not have a lengthy relationship with any of the three students with MD. About half the students spent the majority of their time during the program with one of the three students with MD while about half the students spent the majority of their time with a different student enrolled in Alyse, Van, and Frankie’s special education classroom.
## Table 2-3: Participant demographic information

<table>
<thead>
<tr>
<th>Participant</th>
<th>Age</th>
<th>Grade</th>
<th>Family Member or Close Friend with Difficulty Communicating?</th>
<th>Length of Enrollment in Program</th>
<th>Lengthy (&gt;3 years) Relationship with Student(s) with MD?</th>
<th>Spends Majority of Time in Peer Program with Student(s) with MD?</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Experimental Group</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>11</td>
<td>6&lt;sup&gt;th&lt;/sup&gt;</td>
<td>No</td>
<td>&lt;1 year</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>2</td>
<td>13</td>
<td>7&lt;sup&gt;th&lt;/sup&gt;</td>
<td>No</td>
<td>&gt;1 year</td>
<td>No</td>
<td>Yes, Frankie</td>
</tr>
<tr>
<td>3</td>
<td>12</td>
<td>6&lt;sup&gt;th&lt;/sup&gt;</td>
<td>Yes</td>
<td>&lt;1 year</td>
<td>No</td>
<td>Yes, Alyse</td>
</tr>
<tr>
<td>4</td>
<td>11</td>
<td>6&lt;sup&gt;th&lt;/sup&gt;</td>
<td>No</td>
<td>&lt;1 year</td>
<td>Yes, Alyse and Van</td>
<td>Yes, Alyse</td>
</tr>
<tr>
<td>5</td>
<td>12</td>
<td>6&lt;sup&gt;th&lt;/sup&gt;</td>
<td>No</td>
<td>&lt;1 year</td>
<td>Yes, Van</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>14</td>
<td>8&lt;sup&gt;th&lt;/sup&gt;</td>
<td>No</td>
<td>&lt;1 year</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>7</td>
<td>11</td>
<td>6&lt;sup&gt;th&lt;/sup&gt;</td>
<td>No</td>
<td>&lt;1 year</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>8</td>
<td>13</td>
<td>8&lt;sup&gt;th&lt;/sup&gt;</td>
<td>No</td>
<td>&lt;1 year</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>9</td>
<td>12</td>
<td>7&lt;sup&gt;th&lt;/sup&gt;</td>
<td>Yes</td>
<td>&gt;1 year</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>10</td>
<td>14</td>
<td>8&lt;sup&gt;th&lt;/sup&gt;</td>
<td>No</td>
<td>&lt;1 year</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>11</td>
<td>13</td>
<td>7&lt;sup&gt;th&lt;/sup&gt;</td>
<td>No</td>
<td>&gt;1 year</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>12</td>
<td>13</td>
<td>8&lt;sup&gt;th&lt;/sup&gt;</td>
<td>No</td>
<td>&gt;1 year</td>
<td>No</td>
<td>Yes, Alyse</td>
</tr>
<tr>
<td><strong>Control Group</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>13</td>
<td>7&lt;sup&gt;th&lt;/sup&gt;</td>
<td>No</td>
<td>&lt;1 year</td>
<td>No</td>
<td>Yes, Frankie</td>
</tr>
<tr>
<td>2</td>
<td>11</td>
<td>6&lt;sup&gt;th&lt;/sup&gt;</td>
<td>Yes</td>
<td>&lt;1 year</td>
<td>No</td>
<td>Yes, Alyse</td>
</tr>
<tr>
<td>3</td>
<td>13</td>
<td>7&lt;sup&gt;th&lt;/sup&gt;</td>
<td>No</td>
<td>&gt;1 year</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>4</td>
<td>13</td>
<td>7&lt;sup&gt;th&lt;/sup&gt;</td>
<td>No</td>
<td>&gt;1 year</td>
<td>No</td>
<td>Yes, Alyse</td>
</tr>
<tr>
<td>5</td>
<td>12</td>
<td>7&lt;sup&gt;th&lt;/sup&gt;</td>
<td>Yes</td>
<td>&gt;1 year</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>6</td>
<td>12</td>
<td>6&lt;sup&gt;th&lt;/sup&gt;</td>
<td>No</td>
<td>&lt;1 year</td>
<td>Yes, Van</td>
<td>Yes, Van</td>
</tr>
<tr>
<td>7</td>
<td>13</td>
<td>7&lt;sup&gt;th&lt;/sup&gt;</td>
<td>No</td>
<td>&lt;1 year</td>
<td>No</td>
<td>Yes, Frankie</td>
</tr>
<tr>
<td>8</td>
<td>11</td>
<td>6&lt;sup&gt;th&lt;/sup&gt;</td>
<td>No</td>
<td>&lt;1 year</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>9</td>
<td>11</td>
<td>6&lt;sup&gt;th&lt;/sup&gt;</td>
<td>Yes</td>
<td>&lt;1 year</td>
<td>Yes, Van</td>
<td>No</td>
</tr>
<tr>
<td>10</td>
<td>14</td>
<td>8&lt;sup&gt;th&lt;/sup&gt;</td>
<td>No</td>
<td>&gt;1 year</td>
<td>Yes, Van</td>
<td>No</td>
</tr>
<tr>
<td>11</td>
<td>11</td>
<td>6&lt;sup&gt;th&lt;/sup&gt;</td>
<td>No</td>
<td>&lt;1 year</td>
<td>No</td>
<td>Yes, Van</td>
</tr>
<tr>
<td>12</td>
<td>14</td>
<td>8&lt;sup&gt;th&lt;/sup&gt;</td>
<td>No</td>
<td>&gt;1 year</td>
<td>No</td>
<td>Yes, Frankie</td>
</tr>
<tr>
<td><strong>Overall</strong></td>
<td>12.4</td>
<td>6.8</td>
<td>No</td>
<td>&lt;1 year</td>
<td>No</td>
<td>Split Yes/No</td>
</tr>
</tbody>
</table>
Materials

Video clips. Over the course of weeks, each of the three students with multiple disabilities were videoed during different parts of their school days. Then, video was reviewed and organized into a series of many brief clips showcasing each participants’ demonstration of their associated communicative behaviors as well as instances of non-communication (e.g., blinking and turning head to adjust position). The video focused on the students; other individuals’ faces were out of the frame and, in instances where their faces appeared briefly in the frame, the frame was cropped. Each clip was 1.5 to 4 s in length. A total of 10 clips of each communicative behavior and nine clips demonstrating non-communication for each participant were created. Instances of non-communication involved times when, according to expert partners, the individual was not demonstrating a communicative behavior. The students’ teacher reviewed 10 clips of each student across behaviors (i.e., Communicative Behavior #1, Communicative Behavior #2, and non-communicative behavior) and agreed with the categories assigned to 100% of clips.

The video clips were randomly assigned to the creation of three video probes (to measure the dependent variables) and one training (i.e., the independent variable) using a random number generator. A total of 18 clips were assigned to each probe. The 18 clips were comprised of six clips featuring each of the three students with multiple disabilities (i.e., six clips of Alyse, six clips of Van, and six clips of Frankie). Of each of those groups of six clips, two of the clips demonstrated instances of Communicative Behavior #1 for that student, two of the clips demonstrated instances of Communicative Behavior #2 for that student, and two of the clips showed instances of non-communicative behavior by the student (e.g., playing with a toy). The remaining clips not appearing in either of the three probes were used in the training. The training
included four clips of each communicative behavior for each participant and three clips of non-communication for each participant. See Appendix A for a visual breakdown of the video clips.

**Communication app.** An AAC app allowing for the integration of visual scene displays within video (Light, McNaughton, & Jakobs, 2014) under development at Invotek (Jakobs) housed the video clips used both for the probes and for the intervention. The app was housed on 12.2” Samsung tablets. The app allowed for the quick and easy creation of video visual scene displays, or videos depicting scenes from life. The video visual scene displays can be programmed and used for communication. They can be programmed by the addition of hotspots. Hotspots allow an area of a visual scene display to activate voice output when selected. For instance, if a person smiles and laughs in a video visual scene display, at the end of the video a user could touch the face of the person in the video visual scene display which could output the message “That’s funny!” This allows the video visual scene displays to be used as symbolic communication.

For the probes, the app served as a simple, convenient, and effective mode to show the video clips to students. For the training, the app provided multiple advantages to make it a critical component of the current training.

In typical development symbolic communication emerges from presymbolic communication; words emerge from vocalizations (Paul, 1997). Therefore, for individuals who communicate presymbolically through gestures, facial expressions, vocalizations, and body movements and do not have speech, effective symbolic aided AAC might use these idiosyncratic behaviors as its precursor. Static visual scene displays have been used effectively in the past as aided AAC for school-aged individuals with multiple disabilities who are beginning communicators (Holyfield et al., 2017). However, static images do not allow for the depiction of
dynamic elements of presymbolic behavior (i.e., sound, movement). Video visual scene displays, on the other hand, are dynamic and therefore allow for dynamic communicative behaviors to be captured and displayed.

There was a second reason to use the app for the training rather than playing video for participants; the app allowed for participants to interact with the content of the training rather than view it passively. The interactive nature of the training was designed to be engaging and motivating for the middle school participants and, in turn, promote learning.

Thirdly, a comprehensive AAC intervention might include communication partners’ use of an app such as the one in the current study during interactions with individuals with multiple disabilities. Therefore, trainings that utilize such apps, if effective, may scaffold communication partners’ transition from learning the material to using it during interactions.

**Probe Procedure**

Two speech-language pathologists were trained in administering the probes that allowed for the measure of the dependent variables (see Appendix B for the procedures outlined). Along with the primary investigator, also a speech-language pathologist, the three administered the video probes to measure participants’ performance in interpreting different behaviors performed by the students with multiple disabilities.

Participants each completed the testing task twice. Each time they completed the task using a different video probe. The participants were randomly assigned to the probes they would complete and the order in which they completed them to counterbalance any unintended effects resulting from variation between the probes. Prior to each probe, investigators oriented the participant to the task and to the response form. Then, the investigator began to play the video
probe. She paused the video after the second playing of each clip to allow the participant time to respond.

Participants wrote responses on a probe response form (See Appendix C). Participants’ responses for each video clip included the following: (a) a determination of whether or not the behavior in the clip was communicative (indicated by circling “yes” or “no”), (b) the intent behind those behaviors determined to be communicative (indicated with an open-ended written response), and (c) their level of certainty in the above determinations (indicated by circling a number on a scale of 1 to 7). No feedback related to accuracy of responses was provided.

Videos of probe sessions were reviewed by a trained graduate student in speech-language pathology to allow for a check of procedural fidelity. Procedural fidelity was measured for just over 20% of the probes administered across the three administers using a procedural fidelity checklist (Appendix D). Mean procedural fidelity of the probe procedures was 99.5% (range=97-100).

**Training Procedure**

The training, which served as the independent variable in the current study, contained the following major instructional components: an overview, an opportunity for buy-in, modeling, practice, feedback, and video material. These components, all except the video material, have been suggested as effective components of partner trainings in AAC (Kent-Walsh et al., 2015; Kent-Walsh & McNaughton, 2005). The video material was chosen for its utility in displaying subtle and dynamic behaviors, its potential for translation to AAC use for beginning communicators, and its allowance for the depiction of multiple exemplars (i.e., rather than a single written definition describing the components of a behavior, multiple video clips can show the components of a behavior being completed at multiple times).
The content conveyed during the training was two specific communicative behaviors demonstrated by each of the three students with multiple disabilities, conveyed through video exemplars and spoken operational definitions, and the meaning behind those behaviors. Operational definitions were included in the training as a lack of operational definitions has been cited as a reason for inconsistency in the interpretation of presymbolic communicative behaviors in the past (Carter & Iacono, 2002). The training conveyed information about specific communicative behaviors rather than general strategies of responsivity because in order to respond effectively to a person’s communication, one first needs to recognize it as communication and interpret its meaning accurately. Informing communication partners about the specific communicative behavior of presymbolic communicators has been outlined as a research priority (Carter & Iacono, 2002).

The investigator and another speech-language pathologist administered the training to participants. Procedures for the training are outlined in Appendix E. All training sessions occurred one-on-one with a participant and an interventionist. The training session lasted approximately 10 min and occurred in one session. The training began with a short introduction including the purpose of the task, an orientation to the training (e.g., that they would be looking at videos with the interventionist and along with her deciding if each video demonstrating communication, and if so what that communication meant), and a brief explanation of the source of the content of the training and the credibility of the information (i.e., the investigator spoke with the parents and teacher of the students in the video about their communication). Additionally, in accordance with proposed best practice guidelines for partner training by Kent-Walsh and McNaughton (2005), students were given the opportunity to decide if the information
from the training was something they would be interested in learning or that would benefit them in their interactions in the school program.

Following the introduction, the app on the tablet with video visual scene display capabilities was introduced and served as the modality for the visual content of the training. For the training, videos were organized into three sections. One section was dedicated to each of the three students with multiple disabilities: Alyse, Van, and Frankie. The sections were organized in that order and participants were all trained on the communication of the students with multiple disabilities in that same order. First, the interventionist played a video of Alyse performing her Communicative Behavior 1, “I’m unhappy.” The investigator applied the linguistic map to this communicative behavior (i.e., “In this video, Alyse is saying ‘I’m unhappy.’”). Then, the interventionist outlined the minimum behaviors that indicated this communicative behavior along with any behaviors that were not required but frequently occurred with the communicative behavior (i.e., “I can tell she’s saying ‘I’m unhappy’ because her eyebrows are lowered and her arms are moving. Also, sometimes, like in this video, she groans when she’s saying ‘I’m unhappy.’”). The interventionist then played the video again and programmed a hotspot with the output of the linguistic map (i.e., “I’m unhappy.”). The interventionist outlined her Communicative Behavior #2, “That’s funny,” the same way. Students were then informed that for the remaining videos, some will demonstrate the first communicative behavior, some will demonstrate the second communicative behavior, and some will not show communication at all. For these remaining videos (each played twice), the students decided if each was depicting Communicative Behavior #1, Communicative Behavior #2, or non-communication. They received feedback about each decision then programmed a hotspot with the linguistic map for each video. When correct, the feedback provided confirmation (e.g., “Yeah! She’s saying,
“That’s funny!”). When incorrect, the feedback provided correction (e.g., “It can be hard to notice, but here she is saying ‘I’m unhappy.’ I can tell she’s saying ‘I’m unhappy’ because here eyebrows are lowered and her arm is moving.”). These procedures were repeated for the block of videos for the remaining two students, Van and Frankie. The order remained consistent for each participant in order to avoid an added confound (i.e., order effect of intervention) beyond the scope of the current study to evaluate.

The same graduate student who evaluated procedural fidelity of the probe procedures also was trained and completed procedural fidelity of the training procedures. Following a treatment fidelity checklist (Appendix F), the student assessed procedural fidelity for a third of the training sessions across the two administers, and found mean procedural fidelity to be 94.3% (range=93-98).

**Measures and Data Analysis**

**Measures.** The primary dependent variable was used to compute a gain score for each participant, calculated by subtracting raw pretest probe scores from raw posttest probe scores (both on a scale of 0-18). For each item, participants circled “yes” or “no” to whether they thought the student with multiple disabilities in the clip was communicating. If yes, participants also wrote the concept they believed the person was communicating (e.g., “Hello”). Responses for each item were either scored as correct (1) or incorrect (0), for a highest possible score of 18 for the entire probe. Item responses were scored as correct if a student: (a) identified a video demonstrating non-communicative behavior as non-communicative by circling “No” for the question “Was the person communicating?,” or (b) identified a video demonstrating communicative behavior as communicative by circling “Yes” in response to the question “Was the person communicating” and writing the linguistic map in response to the open-ended
question “What was the person communicating?”. Responses including the correct linguistic map were only counted as correct if they did not include extraneous words that changed its meaning (e.g., for videos with the core linguistic map “ball,” responses of “ball, please” would be counted as correct, while responses of “no ball” would be counted as incorrect. Coding for this measure was completed by a trained graduate student in speech-language pathology who was blinded to the condition and sequence of testing associated with each of the response forms. Coding was performed by comparing participants’ written responses to the coding scheme described above.

Responses corresponding to the secondary dependent variable were also reviewed. For this measure, participants circled a number on a Likert-type scale of 1 to 7 to indicate their level of certainty about their response to each item. Circling 1 indicated, “I just guessed” while circling 7 indicated “I am sure.” Participant responses were scored with a one-to-one correlation with their responses unless participants circled in between numbers. In this case, responses were rounded down to the nearest whole number.

Analyses. To address Question #1 (i.e., What is the effect of a peer training on the number of behaviors from middle schoolers with MD correctly interpreted by typically-developing middle school peers?), the primary research question of the current study, the primary dependent variable was analyzed using a one-way analysis of variance (ANOVA; Brownlee & Brownlee, 1965) was completed to compare gain scores of participants in the two groups (experimental and control). To ensure the appropriateness of the ANOVA, assumptions of heterogeneity of variance and normal distribution were tested. In order to determine the size of any effects completed, Eta squared was calculated (Cohen, 1973). Relative to one-way analysis of variance, an effect size of 0.40 or more is considered to be a large effect (Cohen, 1988).
Question #2 (i.e., do results differ across the three students with MD?) was addressed using a mixed ANOVA (Brownlee & Brownlee, 1965) to compare participants’ gain scores specific to their performance interpreting behaviors across each of the three students with MD. To determine this, the factors in the ANOVA included the student with MD associated with a given clip (i.e., Alyse, Frankie, or Van), the condition (i.e., experimental or control) and the interaction between the student and the condition.

Question #3 (i.e., is the training effective in teaching the interpretation of each of the six communicative behaviors?) was explored by calculating the frequency with which all participants in each group (experimental and control) as a whole accurately interpreted each of the six communicative behaviors in the pretest and posttest probes. As each behavior appeared twice in each probe and there were 12 participants in each group, there were 24 opportunities for each group to interpret each behavior, so frequencies occurred out of 24 opportunities. Then frequency of accurate interpretation from the pretest was subtracted from posttest frequency to determine any increases in frequency of identifying each communicative behavior from pretest to posttest for each group. Frequencies were also calculated as percentages by dividing each frequency by 24 then multiplying by 100.

Question #4 (i.e., do results differ between communicative and non-communicative behaviors?), was answered using a mixed ANOVA (Brownlee & Brownlee, 1965) of the increases from pretest to posttest probes in percentages. Percentages were used as more opportunities to interpret communicative behaviors (12) existed in each probe than did opportunities to interpret non-communicative behaviors (6). Factors in the ANOVA were the percent increase and the interaction between the type of communication (communicative or non-communicative) and the group.
Question #5 (i.e., what is the effect of a peer training on the level of certainty with which typically-developing middle schoolers interpret the behaviors of middle schoolers with MD?) was addressed by analyzing data gathered from the secondary dependent variable. Participants’ median reported level of certainty were calculated from their responses for each probe. As participants completed self-report on a Likert-type scale (Likert, 1932), this variable yielded ordinal data. Therefore, the median was the measure of central tendency calculated and reported (Jamieson, 2004). Then, participants’ median scores were compared across the pretest and posttest probes using a Wilcoxon signed rank test (Woolson, 2008) to determine any changes. This test was completed separately for each condition. Then, a Mann Whitney U test (Mann & Whitney, 1947) comparing participants’ median scores in the posttest probe across conditions (i.e., control group and experimental group) was completed to determine if there were any differences between the groups after the experimental group had completed the intervention.

All analyses were completed using R, a free online statistical language and environment software (R Core Team, 2017). Additionally, published packages within R were utilized in order to complete the power analysis prior to the start of the study (Champley, 2016), to complete Levene’s Test in order to test the homogeneity of variance assumption required to complete the analysis on the primary dependent variable (Wickham, 2007; Fox & Weisberg, 2011), and to calculate the size of the effect of the training (Navarro, 2015).

**Reliability.** A second graduate student in speech-language pathology was trained on the coding procedures in order to complete reliability for the primary dependent variable. The student completed reliability on 20.8% of the data. Point-by-point reliability was calculated by dividing agreements by agreements + disagreements. This number was then multiplied by 100 to
yield a percentage. Reliability was calculated to be 96%. The first coder’s data were used for analysis.

**Social validity.** Three weeks after the end of the study, questionnaires were distributed to professionals in the classroom (Appendix G) and peers who participated in the training (Appendix H) in order to assess the social validity of the training (Question #6). The items on the questionnaire were designed to assess professional and peer perceptions on: (a) the need for a training such as this one, (b) the engagement level of the training, (c) the training’s effectiveness in teaching target information, (d) the extent to which information learned in the training was applied during interactions with the students with multiple disabilities, and (e) any subsequent impact this application had on the students with multiple disabilities. These factors were deemed important to determining the extent to which this or a similar training might garnish uptake and the value in any uptake garnished. Additionally, peers completed open-ended questions their favorite aspect of the training and any suggestions they may have had for improving the training in the future.

Five professionals who worked in the special education classroom attended by the three students with multiple disabilities were asked to complete a social validity questionnaire. All five professionals completed and returned the questionnaire. Five of the 12 students who participated in training completed and returned the social validity questionnaire. This low response rate may have been influenced by the manner in which social validity information was gathered from the students – the questionnaires were sent out for students to return, rather than being administered on the spot by the investigator during the peer program.
CHAPTER THREE

Results

Results are organized by each of the six research questions. First, the effect of the reported is reported. Then, effects as they relate to each of the students with MD, each of the specific communicative behaviors, and communicative/non-communicative behaviors are explored. Then, participants’ self-reported level of certainty is outlined. Finally, results from the social validity questionnaire are outlined.

Efficacy of the Training (Question #1)

Table 3-1 lists the pretest and posttest probe scores for each participant in both groups. In the pretest probes, participants demonstrated limited accuracy interpreting the behaviors of the students with multiple disabilities. They had difficulty both in discriminating between communicative and non-communicative behaviors and in associating an accurate linguistic map to communicative behaviors. Interpretations varied widely from peer to peer, with some participants ascribing communicative intent to most behaviors while some participants ascribed communicative intent to very few behaviors. Some students, still, ascribed communicative intent to those behaviors that were identified by expert partners as non-communicative while failing to do so for those behaviors experts deemed communicative. There was additionally no consensus among peers with regard to the linguistic maps used. Peers interpreted the communicative behaviors very differently from one another and from expert communication partners. Examples of inaccurate linguistic maps from peers included maps unrelated to those named by expert partners (e.g., “I’m cold,” “I’m hungry,” “I need a hug”) and those that were opposite of those named by expert partners (e.g., “I want more” when the linguistic map assigned by expert partners was “I don’t want it”).
Following the training, participants in the experimental group increased their performance interpreting the behaviors of the three middle schoolers with MD. The participants demonstrated an average gain score of 9.5 (out of 18), compared to an average gain score of -0.6 (out of 18) for participants in the control group. Variability also decreased from pretest to posttest probe for the experimental group, with the standard deviation decreasing from 3.1 in the pretest to 1.8 in the posttest.
Table 3-1: Participants’ pretest probe, posttest probe, and gain scores, across groups

<table>
<thead>
<tr>
<th>Participant</th>
<th>Pretest Score</th>
<th>Posttest Score</th>
<th>Gain Score</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Experimental Group</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>5</td>
<td>18</td>
<td>13</td>
</tr>
<tr>
<td>2</td>
<td>6</td>
<td>15</td>
<td>9</td>
</tr>
<tr>
<td>3</td>
<td>8</td>
<td>16</td>
<td>8</td>
</tr>
<tr>
<td>4</td>
<td>6</td>
<td>14</td>
<td>8</td>
</tr>
<tr>
<td>5</td>
<td>2</td>
<td>16</td>
<td>14</td>
</tr>
<tr>
<td>6</td>
<td>9</td>
<td>16</td>
<td>7</td>
</tr>
<tr>
<td>7</td>
<td>7</td>
<td>13</td>
<td>6</td>
</tr>
<tr>
<td>8</td>
<td>0</td>
<td>12</td>
<td>12</td>
</tr>
<tr>
<td>9</td>
<td>5</td>
<td>16</td>
<td>11</td>
</tr>
<tr>
<td>10</td>
<td>6</td>
<td>15</td>
<td>9</td>
</tr>
<tr>
<td>11</td>
<td>12</td>
<td>18</td>
<td>6</td>
</tr>
<tr>
<td>12</td>
<td>6</td>
<td>17</td>
<td>11</td>
</tr>
<tr>
<td></td>
<td><strong>Mean(SD)</strong></td>
<td><strong>15.5(1.8)</strong></td>
<td><strong>9.5(2.7)</strong></td>
</tr>
<tr>
<td></td>
<td>Control Group</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>3</td>
<td>5</td>
<td>2</td>
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<tr>
<td>2</td>
<td>4</td>
<td>1</td>
<td>-3</td>
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<td>3</td>
<td>6</td>
<td>5</td>
<td>-1</td>
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<tr>
<td>4</td>
<td>2</td>
<td>2</td>
<td>0</td>
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<tr>
<td>5</td>
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<tr>
<td>6</td>
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<tr>
<td>7</td>
<td>3</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>8</td>
<td>4</td>
<td>9</td>
<td>5</td>
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<td>9</td>
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<td>6</td>
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<tr>
<td>10</td>
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<tr>
<td>11</td>
<td>9</td>
<td>8</td>
<td>-1</td>
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<tr>
<td>12</td>
<td>7</td>
<td>8</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td><strong>Mean(SD)</strong></td>
<td><strong>5.6(2.5)</strong></td>
<td><strong>5.0(2.7)</strong></td>
</tr>
</tbody>
</table>
Figure 3-1 shows boxplots of the participants’ gain scores in each condition. To determine if the apparent difference between these groups was significant, an ANOVA was performed. On average, the participants in the experimental condition demonstrated a statistically significant higher gain score than participants in the control condition \(F(1, 22) = 78.907, p < .001\).
Not only did the training have a statistically significant effect on participants’ interpretations of the behaviors of the students with multiple disabilities, but the effect was large. The large effect size was determined by an Eta squared value of 0.78.

To confirm the appropriateness of the statistical analysis completed to address the primary question of the study, the author ensured the three major assumptions of an ANOVA test were met. First, the two conditions were independent, as different participants accounted for the scores in the two groups. Second, the data were normally distributed, as confirmed by visual analysis of the normal quantile-quantile (Q-Q) plot (see Figure 3-2).
Figure 3-2: Normal quantile-quantile (Q-Q) plot indicating the normality of distribution of gain scores

Third, the assumption of homogeneity of variance was met, as confirmed by Levene’s test $[F(1,22) = 0.0158, p = 0.901]$.

To explore the exact coding used, refer to Appendix I to view the code inputted into R for the above statistical analyses. Appendix J contains the subsequent output from R.
Effects by Students with Multiple Disabilities (Question #2)

Results from the ANOVA indicated there was no main effect of student with multiple disabilities on gain scores \(F(2,66) = 2.248, p = 0.114\). Additionally, there was no interaction effect between student with multiple disabilities and condition (i.e., experimental or control group) \(F(2,66) = 0.400, p = 0.672\). Therefore, there was no statistically significant difference in the effect of the training when comparing participant performance in interpreting the communicative behaviors of each of the three students with multiple disabilities; the training equally impacted performance interpreting the behaviors of each of the students.

Effects for Each Communicative Behavior (Question #3)

Additionally, changes in accuracy were explored relative to each of the six target communicative behaviors. For each behavior, the frequency with which it was accurately interpreted by all participants in each group in each probe (pretest and posttest) was calculated. Then, increases in frequency were calculated for each behavior for each group. Results were also reported in percentages (see Table 3-2).

In the experimental group, participants displayed an increase in interpretation accuracy for each of the six behaviors. Increases were large, ranging from 42% to 79%. The largest increase was observed for Alyse's communicative behavior “That’s funny.” The smallest increase was observed for Alyse’s communicative behavior “I’m unhappy.”

In the control group, participants demonstrated little increase in their accuracy interpreting each of the six behaviors. In fact, the largest change observed was a decrease in accuracy. Increases in interpreting communicative behaviors within the control group ranged from -25% to 2%, indicating relatively stable scores from pretest to posttest for each of the six communicative behaviors.
Table 3-2: Frequency (out of 24) and percentage with which communicative behaviors were accurately interpreted by students in pretest and posttest probes and the increase between the two probes, across groups

<table>
<thead>
<tr>
<th></th>
<th>Experimental Group</th>
<th>Control Group</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pretest</td>
<td>Posttest</td>
</tr>
<tr>
<td><strong>Alyse</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>“That’s funny.”</td>
<td>0 (0%)</td>
<td>19 (79%)</td>
</tr>
<tr>
<td>“I’m unhappy.”</td>
<td>4 (16%)</td>
<td>14 (58%)</td>
</tr>
<tr>
<td><strong>Van</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>“I want the ball.”</td>
<td>11 (46%)</td>
<td>24 (100%)</td>
</tr>
<tr>
<td>“Yes, I want it.”</td>
<td>8 (33%)</td>
<td>22 (92%)</td>
</tr>
<tr>
<td><strong>Frankie</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>“I want it.”</td>
<td>8 (33%)</td>
<td>24 (100%)</td>
</tr>
<tr>
<td>“I don’t want it.”</td>
<td>2 (8%)</td>
<td>20 (83%)</td>
</tr>
</tbody>
</table>

**Effects by Type of Behavior (Question #4)**

Then, differences in effects of the training were compared by considering percent increases from pretest to posttest probe across type of behavior: communicative and non-communicative. An ANOVA revealed a statistically significant interaction between type of behavior (i.e., communicative and non-communicative) and condition (i.e., experimental and control group) [F(1,44)=4.742, p=0.0348]. This result indicated there was a statistically significant difference between at least one of the following: (a) percent increase in accuracy in interpretation of communicative behaviors by the control group and percent increase in accuracy
in interpretation of non-communicative behaviors by the control group, (b) percent increase in accuracy in interpretation of communicative behaviors by the control group and percent increase in accuracy in interpretation of communicative behaviors by the experimental group, (c) percent increase in accuracy in interpretation of communicative behaviors by the control group and percent increase in accuracy in interpretation of non-communicative behaviors by the experimental group, (d) percent increase in accuracy in interpretation of non-communicative behaviors by the control group and percent increase in accuracy in interpretation of communicative behaviors by the experimental group, (e) percent increase in accuracy in interpretation of non-communicative behaviors by the control group and percent increase in accuracy in interpretation of communicative behaviors by the experimental group, or (f) percent increase in accuracy in interpretation of communicative behaviors in the experimental group and percent increase in accuracy in interpretation of non-communicative behaviors in the experimental group.

In order to determine which of these comparisons were statistically significant, Tukey’s Honestly Significant Difference (HSD) Test was completed. This test revealed that all of the above comparisons resulted in statistically significant difference except one: there was no statistically significant difference in the control groups’ percent increase in identification of communicative and non-communicative behaviors.

The differences that were present indicated the experimental group experienced greater increases in interpreting both types of behavior as compared to the control groups’ increases in interpreting of either type of behavior. However, the experimental group experienced a larger increase in identifying communicative behavior than they did in interpreting non-communicative behavior as a result of the training. Figure 3-3 plots the confidence intervals for each of the six
comparisons, demonstrating only one (i.e., communicative behaviors from the control group and non-communicative behaviors from the control group) contains zero, suggesting it is not statistically significant. This finding is consistent with the result that participants in the control increased neither their identification of communicative or non-communicative behaviors from pretest to posttest.

Figure 3-3: 95% confidence level of differences in mean levels of percent increase for each type of communication across and between each group

**Effects on Level of Certainty (Question #5)**

In addition to accuracy of interpreting communicative and non-communicative behaviors, the level of certainty with which participants responded to each of the 18 items on each probe (pretest and posttest) was evaluated through participants’ self-report on a scale of 1 (“I just guessed.”) to 7 (I’m sure.”). Each participants’ median response and the range of their responses in each probe (pretest and posttest) were calculated and shown in Table 3-3.
Table 3-3: Median and range of participants’ level of certainty in judging each video for participants across each probe on a scale of 1 ("I just guessed.") to 7 (I’m sure.”), across groups

<table>
<thead>
<tr>
<th>Participant</th>
<th>Pretest Median</th>
<th>Pretest Range</th>
<th>Posttest Median</th>
<th>Posttest Range</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Experimental Group</td>
<td></td>
<td>Control Group</td>
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<tr>
<td>1</td>
<td>5</td>
<td>3-7</td>
<td>7</td>
<td>7-7</td>
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<td>2</td>
<td>5</td>
<td>1-7</td>
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<td>3</td>
<td>1-5</td>
<td>6</td>
<td>4-7</td>
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<tr>
<td>9</td>
<td>3.5</td>
<td>2-6</td>
<td>6</td>
<td>3-7</td>
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<td>3</td>
<td>1-5</td>
<td>5.5</td>
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<td>11</td>
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<td>3-7</td>
<td>6</td>
<td>4-7</td>
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<tr>
<td>12</td>
<td>4</td>
<td>1-7</td>
<td>5</td>
<td>5-7</td>
</tr>
<tr>
<td>Overall</td>
<td>5</td>
<td>1-7</td>
<td>6.5</td>
<td>3-7</td>
</tr>
</tbody>
</table>

Results from the Wilcoxon Signed Rank Test revealed that while there was no significant difference between the reported level of certainty of the control group from the pretest to the posttest probe (p=0.06), the level of certainty reported by the experimental group from the pretest
to the posttest probes was significantly different (p=0.004). Additionally, the Mann-Whitney U Test results revealed the level of certainty reported in the posttest probe differed across the two groups (p=0.0002).

**Social Validity (Question #6)**

**Professionals.** The five professionals who completed and returned the social validity questionnaire “strongly agreed” or “agreed” with each item in the questionnaire. Responses are outlined in Table 3-4. Professionals indicated they felt: it was important for peers to interact effectively with the students in their class, peers were interested in the training, peers benefited from the training, they would implement the training in the future, they noticed communication improve between the students in their class and peers who had participated in the training, and the students with multiple disabilities seemed to enjoy interacting with peers more after they participated in the training.

Table 3-4: Classroom professionals’ responses to the social validity questionnaire

<table>
<thead>
<tr>
<th>Questionnaire Item</th>
<th>Strongly Disagree</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>It is important for peers to be able to be able to interact effectively with students in this class.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>The peers appeared interested in the training.</td>
<td>1</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The peers benefited from the training.</td>
<td>2</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I would implement the training with peers in the future.</td>
<td>1</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I noticed communication between students improve after the training.</td>
<td>1</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The students with multiple disabilities seemed to enjoy interactions with peers more after the training.</td>
<td>1</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Additionally, several of the professionals volunteered additional, open-ended information when handing in their responses to the social validity questionnaire. One paraprofessional shared that “students who before never interacted with [Van] started coming up to him and talking with him” following the training. Another paraprofessional added that she’s noticed that after completing the training “peers have given more time for the students [with multiple disabilities] to respond, and have done more reacting to their behaviors” instead of just having a one-way conversation with the students.

Peers. Five of the 12 participants who completed the training returned the social validity questionnaire. Overall, most participants strongly agreed or agreed with each item on the questionnaire. Table 3-5 outlines peer participants’ responses to the questionnaire.

Table 3-5: Peer participants’ responses to the social validity questionnaire

<table>
<thead>
<tr>
<th>Questionnaire Item</th>
<th>Number of Responses per Category (out of 5)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Strongly Disagree</td>
</tr>
<tr>
<td>It is important for me to communicate effectively with the students in [this program].</td>
<td>1</td>
</tr>
<tr>
<td>I liked the training.</td>
<td>1</td>
</tr>
<tr>
<td>I learned from the training.</td>
<td>1</td>
</tr>
<tr>
<td>I still remember what I learned from the training.</td>
<td>3</td>
</tr>
<tr>
<td>I recognize more communication from the students since the training.</td>
<td>1</td>
</tr>
<tr>
<td>I have used something I learned from the training while interacting with the students.</td>
<td>1</td>
</tr>
<tr>
<td>I am able to communicate more effectively with the students after the training.</td>
<td>3</td>
</tr>
<tr>
<td>I enjoy [this program] even more after the training.</td>
<td>1</td>
</tr>
</tbody>
</table>
In addition to the Likert-type scale items (Likert, 1932) on the peers’ social validity questionnaire, peers also completed open-ended questions about what they liked about the training and any suggestions they had about the training. All five students indicated their favorite part of the training was learning about the how the students communicate and/or how to communicate with them (e.g., “learning more about how to communicate with students,” “getting to see the different ways [Van], [Frankie], and [Alyse] communicate”). One student added that she enjoyed that she was able to see the communication live in interactions with the students after completing the training.

Suggestions for the training were more varied. One student indicated she would like the training to include interacting with the students. One student indicated she may have benefited for more explanation beforehand. One student indicated the sessions were too long; however, she was referring to the length of the pretest and posttest probes in addition to the training, not just the training itself. One student would have liked to have received feedback about whether her responses were correct or incorrect; this student was also referring to the probes rather than the training. And finally, one student’s simple suggestion was to keep teaching the information “because it is fun and unique.”
CHAPTER FOUR

Discussion

While there is wide agreement on the importance in supporting the communication of school-aged individuals with MD and the value of supporting partner interpretation of the prelinguistic communicative behaviors of those students with MD who have not yet developed conventional, symbolic language use (Grove et al., 1999; Iacono et al., 1998; Sigafoos et al., 2000), limited research evaluating partner trainings toward this end is available. This study serves as an early, yet important, step toward identifying interventions to promote consistent and accurate partner responsivity for school-aged individuals with MD.

Efficacy of the Training (Question #1)

All participants in the pretest demonstrated limited accuracy in interpreting the communicative behavior of the three students with MD with whom they interacted on a regular basis throughout the school week. For participants in the control group, this limited accuracy persisted into the posttest. This limited knowledge about the idiosyncratic communicative behavior of individuals with multiple disabilities and the limited consistency among participants’ responses in the pretest is consistent with previous research demonstrating the difficulty associated with the task of recognizing the communicative behavior of individuals who are presymbolic communicators and have multiple disabilities (e.g., Carter & Iacono, 2002; Wilcox et al., 1990). The task in the current study was even more difficult than tasks in past research as, in addition to recognizing communication, participants also had to interpret its meaning. The limited consistency and lack of consensus from peers in the pretest indicates the students with multiple disabilities were receiving different reactions to their behaviors from different people throughout their school day. In addition to the inaccurate interpretation of their behaviors having
a negative impact on their quality of life, the different linguistic maps being associated to their communicative behaviors limited their opportunities to build a clear association between the behavior, its meaning, and a symbol.

The primary result from this study demonstrated that a short training (lasting less than 15 minutes) was effective in increasing typically developing middle school students’ accuracy in interpreting the communicative behavior of the middle school students with multiple disabilities. The effect was statistically significant, indicating the training is a viable approach to teaching typically developing middle schoolers to interpret the presymbolic communicative behaviors of middle schoolers with multiple disabilities; at the molar level of analysis (Light, 1999), the training was effective. This finding is consistent with previous research demonstrating the effectiveness of partner training in AAC intervention (Kent-Walsh et al., 2015) and the effectiveness of peer intervention for individuals with multiple disabilities (Carter & Hughes, 2005).

The effect of the training on partner interpretation was also large based on the Eta squared calculated. This is an important finding considering the small amount of time (under 15 min) it took each participant to complete the training. This finding suggests this training is both an effective and an efficient use of communication partners’ time. However, the individualized nature of this training compared to most previous partner trainings means this time burden may shift from the participant to the trainer.

Additionally, 100% of participants in the experimental group made marked gains in performance from the pretest to the posttest probes. This indicates that, at the intermediate level of analysis (Light, 1999), each participants’ results were consistent with the overall results. This level of analysis also demonstrates the relatively low variability among posttest scores in the
experimental group. This finding suggests that the training was effective in promoting consensus among participants’ interpretation of the behaviors of the middle schoolers with MD. Building consensus in interpreting these behaviors is a foundational step in building consensus in responding to these behaviors, a major factor in promoting early language development and the emergence of consistent, symbolic communication (Carter & Iacono, 2002; Iacono et al., 1998).

Gain scores of participants in the experimental group ranged from an increase of 6 out of 18 (33%) to 14 out of 18 (78%). This range suggested there may be some difference in impact of the training from individual participant to individual participant. Reviewing the performance of participants in the lower end of the gains made (Participants 6, 7, 11) revealed these were the participants who performed at relatively-higher levels in the pretest. Therefore, while these individuals went on to have strong scores in the posttest, they had less room for improvement than those participants who achieved lower scores during pretest measures. It may be this training is more effective for individuals with less familiarity with the communicative behavior of individuals with multiple disabilities. However, the posttest scores of all participants were high with little variation. Considering these posttest scores are indicative of the learning that may go on to improve interactions between participants and students with multiple disabilities, results suggest the training to be valuable for all participants, even those with lower gain scores.

The training in the current study utilized three of the instructional activities found to effective when used in concert in Kent-Walsh and colleagues’ (2015) meta-analysis (descriptive overview, modeling, and guided practice). However, one instructional activity not utilized by any of the studies included in the meta-analysis was employed in the current training – video material instruction. Video instruction had also not been utilized in peer trainings for adolescents with disabilities in the behavioral literature (Carter & Hughes, 2005). This activity seems to be a
promising one, particularly for use by middle schoolers, based on the results of the current study. Unfortunately, relative effectiveness cannot be compared to results from the meta-analysis as subsequent outcomes on the middle schoolers with multiple disabilities were not included as measures in the study.

Additionally, it is impossible to know which aspects of the training were effective or most important to student learning. It could be that just passively viewing the video would have allowed participants to learn to interpret the behaviors of the middle schoolers with MD. It could be the case that providing the students just with a written operational definition would have been effective in teaching them the new skill. Or, it could be that allowing them the opportunity to participate actively in a different activity and providing the same feedback would have been effective. However, given past findings in AAC partner intervention research that trainings utilizing a number of instructional components together are most effective (Kent-Walsh et al., 2015), and considering the theoretical value of each of these components, it is likely that using them together is what allowed the training to have a large impact on participant performance in a short amount of time.

In addition to the teaching avenues employed, this study differed from those previously established peer trainings relative to the content relayed. Studies in both Carter and Hughes’ (2005) review and Kent-Walsh and colleagues’ (2015) meta-analysis focused on teaching knowledge, skills, and strategies support of interaction with individuals with disabilities generally. In contrast, the current study taught peers specific information about the communicative behaviors of middle schoolers with multiple disabilities. This was likely due to the fact that, unlike the other studies, the current study focused on supporting peers’ knowledge about presymbolic communication. Presymbolic communication is by definition idiosyncratic in
nature (Grove et al., 1999). Therefore, it may require teaching communication partners specifically about these idiosyncratic behaviors. This hasn’t been the case in partner trainings of young children with intellectual and developmental disabilities (e.g., Fey et al., 2006). However, the partners trained in this body of literature are generally parents and guardians who are the most familiar with the idiosyncrasies of their child. If such individualization of trainings is needed when training less familiar communication partners, new challenges for the instructor relative to time and accuracy arise.

It remains to be seen if teaching the specific communicative behaviors of school-aged individuals with multiple disabilities is more effective than teaching more general communication strategies to promote the responsivity of communication partners. On one hand, it may be more likely the knowledge about specific behaviors learned in the training from the current study will generalize to the real-world interactions between the participants and the individuals with MD; by teaching the specific behaviors and the specific response as the content of the training, participants will not have to make the leap of deciding when during an interaction to respond. On the other hand, the generalizability of a training of specific communicative behaviors may be limited in that, as the communicative behaviors of the students with MD evolve and expand, the knowledge gained during the training may no longer be relevant to real-world interactions between the students.

**Effects by Student with Multiple Disabilities (Question #2)**

Contrary to the author’s hypothesis, the impact of the training did not vary by the student with MD whose behavior was being interpreted. Van’s communication represented idiosyncratic approximations of conventional, symbolic communication. The author hypothesized, therefore, his communicative behaviors may be easier for students to recognize without training and
therefore result in the training being less effective in teaching those behaviors. However, this was not the case. Participants benefited as much from the training to interpret his idiosyncratic, emerging symbolic communication. This finding calls into question previous assumptions (e.g., Iacono et al., 1998) that partner training may be less of a necessity for individuals who communicate in clearly intentional and/or emerging symbolic manners. It may be that less familiar partners such as peers require training to identify even approximations of symbolic communication from individuals with multiple disabilities.

**Effects for Each Communicative Behavior (Question #3)**

In the experimental group, the frequency with which each of the 6 (100%) of the target communicative behaviors were accurately interpreted increased from pretest to posttest. Given the training was under 15 min in length and 6 specific communicative behaviors were taught in addition to the provision of overall background information and an opportunity to discriminate communicative from non-communicative behavior, this translates to less than 2 min of teaching being devoted to each behavior. Therefore, trainings such as the one in the current study may be effective in training communication partners to interpret a variety of behaviors with a variety of intents using a variety of modalities (e.g., vocalizations, body movements, facial expressions) alone and in combination. Although, the training of a smaller chunk of behaviors such as the six targeted in the current study, may facilitate the learning of each specific behavior.

Consistent with previous sentiments indicating consensus is harder to build for presymbolic communicative behaviors representing negative affect rather than positive affect (Grove et al., 1999), the communicative behavior participants in the experimental accurately interpreted with the lowest level of frequency in the posttest (following the training) was Alyse’s “I’m unhappy.” In the posttest probe, the experimental group as a whole accurately interpreted
this behavior in 58% (14) of opportunities. This represented an increase of 42% (10) from the pretest – the lowest gain for any of the six behaviors in the posttest for the experimental group. In fact, all other behaviors were recognized with over 20% (and sometimes over 40%) higher accuracy than this particular behavior. While the behavior representing a negative affect may have played a role, the other behavior representing a negative affect (i.e., Frankie’s “I don’t want it.”) was recognized at a much higher frequency following the training. So, it could be that another aspect of this behavior made it harder for participants to interpret, even following the training. For example, perhaps it was the most subtle of the targeted behaviors.

Two behaviors (Van’s “I want the ball.” and Frankie’s “I want it.”) were interpreted accurately in each opportunity by the experimental group in the posttest probe (following the training). These behaviors (i.e., vocally approximating the word “ball” and reaching toward something) may be the two most conventional of the target behaviors. It may be that more conventional or intuitive behaviors are easier to interpret consistently once briefly trained on their meaning. Therefore, encouraging more conventional representations of concepts in communication, even when presymbolic, may be beneficial to the symbolic language development of school-aged individuals with multiple disabilities, as has been argued in previous research (Iacono et al., 1998).

**Effects by Type of Behavior (Question #4)**

An interaction effect of the training and the type of behavior (i.e., communicative or non-communicative) suggested the training had a bigger impact on participants’ interpretation of communicative rather than non-communicative behavior. However, learning these specific behaviors should also result in discriminating between these communicative behaviors and instances of non-communication. While the training had a larger impact on the interpretation of
communicative behaviors than non-communicative behaviors, it still resulted in an increase in
the interpretation of non-communicative behaviors.

It may be the case that, in addition to building accurate interpretation of the behaviors of
the students with multiple disabilities, the training had the ancillary effect of prompting
participants to view the students with agency as communicators more than they had in the past.
This may have caused students to over-interpret behaviors as communicative, even those
behaviors experts do not interpret to be communicative. This explanation, while only a
conjecture, would be consistent with previous research findings of over-ascription of
communicative intent to the behaviors of individuals with multiple disabilities by non-expert
communication partners (Carter & Iacono, 2002).

**Effects on Level of Certainty (Question #5)**

The training appears to have increased the level of certainty with which participants
interpreted the behaviors of the students with MD. This impact of the training may be a
consequential one; tenuous interpretations may be less likely to lead to action during real-world
interactions than assured interpretations. Therefore, this finding might suggest that, in addition to
improving the accuracy of their interpretations, participants in the current study who completed
the training may be more likely to let their actions be guided by these interpretations when
responding to these behaviors as they are demonstrated by the students with MD. This, of course,
is a necessary link for the effects of trainings such as the one evaluated in the current study to
translate into meaningful change for the students with MD who may benefit from it.

**Social Validity (Question #6)**

Overall, professionals and peers agreed the training was needed, was useful, and provided
the peer participants with information they went on to use in conversations with the students with
multiple disabilities. This suggests in addition to being statistically significant, the training may have also been significant in the lives of the participants who completed the training and, most importantly, in the lives of the students with multiple disabilities trainings such as the one in the current study are ultimately meant to impact.

However, the response rate from the participants was low. Therefore, the social validity data gathered in the current study may not be representative of the overall sentiment of all participants who completed the training. It may be the case that participants who did not complete the social validity questionnaire were less invested in the training and therefore may not have rated it, its purpose, and its impact as highly. Alternatively, given the questionnaires were handed out to be returned by participants, it could be the case that some participants simply did not remember to return them.

There are a small number of factors to consider when interpreting the social validity responses of the participants in the current study. One is, the students who participated in the study were recruited through a voluntary program in which they interacted with students with disabilities. Therefore, these students were invested in such interactions prior to the training. Responses on the importance of successful interactions with the students with disabilities, for instance, may have been different if the participants in the current study were recruited from a wider group that included students who did not choose to enroll in such a program. Additionally, the students may also have responded with what they felt was a socially acceptable response rather than with how they really felt. This is a problem when interpreting any self-report social validity measure, and is true for the professionals’ responses as well. A more objective measure of social validity (e.g., professionals’ use of the training with students in the future or
participants’ use of the knowledge from the training in real-life interactions) would have avoided this conflation.

**Clinical Implications**

This study demonstrates that, using powerful teaching tools such as video and considering guidelines for effective partner instruction (e.g., modeling, practice, feedback; Kent-Walsh & McNaughton, 2005), a short training can improve the performance of typically developing middle schoolers in interpreting specific communicative behaviors and discriminating between communicative and non-communicative behaviors performed by other middle schoolers with multiple disabilities. Given accurate interpretation of communicative behaviors is a necessary precursor to responsivity that builds language, a training such as the one evaluated in the current study could be a useful one for speech-language pathologists in schools to employ.

Time is one of the most precious and scarce resources available to speech-language pathologists working in schools today (American Speech-Language-Hearing Association, 2016). Already unmanageable caseloads (American Speech-Language-Hearing Association, 2016) become even more difficult to manage when considering the time required to provide effective intervention services to students who require AAC. Given the time demands speech-language pathologists in schools face, it may not be surprising their time is often committed to direct, one-on-one intervention for students on their caseloads while other important components of effective AAC intervention such as partner training can easily fall to the wayside. Despite the importance of partner training in AAC intervention (Kent-Walsh et al., 2015), particularly as it applies to individuals who are presymbolic communicators (Carter & Iacono, 2002; Grove et al., 1999; Iacono et al., 1998), the reality is these trainings must not only be effective, but also may
need to be highly efficient, for wide uptake to occur. As Green (2008) argues, speech-language pathologists are required to perform evidence-based practice, but they also require “practice-based evidence” (as cited in Light & McNaughton, 2015, p. 4).

While the training appears highly efficient in teaching peers to interpret the behaviors of students with MD, the time peers’ dedicate to completing the training and the time clinicians dedicate to administering the training does not consider every aspect of time committed to such a training. The other important factor when considering efficiency is the time required to create the training. A training such as the one utilized in the current study requires clinicians to individualize content for each student with MD who benefits. This is an added time commitment when compared to a generic training that can be administered again and again without any changes.

However, the current training was designed to reduce the time-burden associated with individualized trainings by incorporating efficiency on multiple levels with the goal of provide practice-based evidence in addition to evidence-based practice. This efficiency occurs on three different levels. First, capturing video on user-friendly apps such as the one used in the current study allows clinicians to quickly and easily create the content for the training. Second, the permanent nature of video allows clinicians to have lasting content for training communication partners that can be added to and adjusted overtime as the communication of students grows and changes. This permanence contrasts with the transient nature of traditional trainings from speech-language pathologists in which information is shared orally and is available only to those present during the training and must be recreated to be shared again. Third, participating in the training in the current study required less than 15 min of peers’ time. While the length of trainings for partners of individuals who are presymbolic communicators will inevitably vary
based on factors such as the number of communicative behaviors being highlighted or the subtly and variability of those behaviors, the power of video as a teaching tool suggests, however long the trainings, they will convey information with high efficiency.

However, this study did not provide evidence that, in turn, the learning that occurred within the peer participants translated to increased outcomes for the students with multiple disabilities. As is always the case with intervention services in schools (American Speech-Language-Hearing Association, 2010), speech-language pathologists should take data evaluating the effectiveness of such a training on the students they serve. For instance, when a student with multiple disabilities and a peer who has completed the training interact, the number of times the peer implements a skill from the training could be counted. If clinicians do not find any changes within these interactions following the training, a different approach or changes to the training may be warranted.

Clinicians should keep in mind that one of the most critical factors accounting for the effectiveness of the training is the accurate definition of communicative behaviors and their meaning (Carter & Iacono, 2002; Ogletree et al., 2012). This aspect of the training may also be the most time consuming piece for clinicians. It will require communication with multiple expert communication partners and systematic observations. Clinicians should take great care in identifying communicative behaviors accurately as they “have an ethical and professional responsibility to be aware of the implications of their actions and to check on the accuracy of their interpretations to ensure, first, that it is an accurate representation of the person’s communication…” (Grove et al., 1999, p. 201). When prioritizing communicative behaviors to define and teach to communication partners, clinicians could follow the model of the current study by first determining those behaviors independently identified by two expert
communication partners, and then choosing the most frequently occurring among those at school – the context in which peer interactions would occur. There is a great deal of variability in the rate of communication acts of individuals who are presymbolic communicators (Iacono et al., 1998), so the frequency with which each behavior occurs may be an important consideration.

One decision clinicians will be required to make is to determine for whom a peer training about their communicative behavior may be appropriate. Given the limitations of traditional measures of intentionality for individuals with multiple disabilities, difficulty in establishing intentional communication should not stop clinicians from moving forward (Grove et al., 1999; Iacono et al., 1998). There will be difficulties associating meaning in an accurate way in such scenarios, but the approach taken by the current study in consulting with expert communication partners seems to be a promising one. Parents or guardians are likely to have assigned some meaning to behaviors regardless of intent behind them (Grove et al., 1999), and are therefore an ideal starting point. Given the relatively low time cost associated with the training, and the fact that participants learned to accurately interpret the communicative behaviors of each of the three students with multiple disabilities equally despite the students’ behaviors having varying levels of conventionality, clinicians may err on the side of including rather than excluding communicative behavior or students whom they think may benefit from such an intervention tool.

Clinicians also have to determine which communication partners should participate in the training. Evidence from this study suggests that peers of students with multiple disabilities should benefit from the study. Given that the participants are typically developing, however, their results are likely to translate to other groups. For instance, if typically developing middle schoolers can learn from the training, typically developing high schoolers and adults would
likely benefit as well. Again, this is an advantage of the information being housed in video. Clinicians can share the training widely with a variety of individuals who interact with students throughout their school day without committing large amounts of time to doing so.

**Limitations and Future Directions**

The overall design of the current study was strong. The only major threat to the internal validity of this design was that, despite random assignment, the two groups were different at the start of the study (Trochim, 2006). Although it is impossible to completely rule out this possibility, the apparent similarity in the groups’ performance on the pretest probe, coupled with the use of gain scores to analyze results rather than raw scores, suggests any potential differences are not a threat. Another limitation of the design was the posttest occurred immediately following the training. Without a second posttest probe spaced far after the training, it is hard to know how long participants’ gains would have remained stable, or if participants forgot information from the training in the weeks following their completion of it. Future research could include more longitudinal measures to determine if such a short training can have a lasting impact on communication partners.

Another limitation of the study was the relatively small number of participants (n=24). Although a power analysis completed before recruitment occurred indicated that about nine participants in each group would allow sufficient power to detect any effect of the training, the small number of participants still limits the external validity of the current study. Future research should include more participants representing a wider variety of communication partner groups. This research could help answer questions such as: (a), can typically developing young children learn to interpret the behaviors of young children with multiple disabilities with access to
training?, and (b) can unfamiliar communication partners learn to interpret the behaviors of middle-school students with multiple disabilities?

Kent-Walsh and McNaughton (2005) outlined eight suggested steps to partner training in AAC intervention. Many of these suggestions (i.e., commitment to program, pretest, description, demonstration, controlled practice, feedback, and posttest) were incorporated into the current training. However, a few components were not included. Including those missing components – particularly advanced practice and generalization of use – may have bolstered the impact of the peer training in the current study. For instance, peers would have likely benefited from the opportunity to generalize their newly acquired skills interpreting the communicative behavior of students with MD during face-to-face conversations as part of the training. However, one important feature of the training used in the current study was its ability to be implemented quickly in under 15 min. Adding more features to the training may increase its efficacy, but any increases in benefits from growing the training would have to be weighed against the additional time required to implement the more complex training. Future research could systematically manipulate specific components and content within partner trainings for school-aged individuals with multiple disabilities to determine which approach to partner training is most effective in promoting consistent responsivity from communication partners.

The specific nature of the content conveyed in the current training is another limitation. Participants only learned about the six most frequently demonstrated communicative behaviors from the students with multiple disabilities. Therefore, knowledge from the training is unlikely to translate meaningfully to other individuals with MD they interact with in their life or to new communicative behaviors acquired by Alyse, Van, and Frankie. Future research should determine if such specificity is necessary to accurate responsivity to idiosyncratic
communicative behaviors. If not, the more general approach to teaching strategies of responsivity to idiosyncratic behaviors in general may be more impactful.

The measures of the study are perhaps its biggest limitation. The current study did not measure the behavior of participants in real-life interactions with the students with multiple disabilities. The effects observed in the study are only meaningful insofar as they translate to increases in the quality of interactions between peer participants and students with multiple disabilities. Therefore, future research should include measures of trainings’ effects on the frequency and complexity of the communication of the students with multiple disabilities.

Finally, the social validity measured in the current study had limitations related to the way in which it was gathered (i.e., self-report) and the low rate of response from peer participants. Future research could explore the social validity of partner trainings for students with MD by evaluating: (a) professionals’ use of such a training (e.g., frequency of use, consistency of use, frequency with which new communicative behaviors are added, frequency with which new partners are trained), and (b) participants’ application of content from the training to interactions with the students with MD (e.g., frequency of responsivity during interactions).

**Conclusion**

All individuals should live in an environment responsive to their communication. All individuals should live in an environment supportive of their language development. Unfortunately, some school-aged individuals with multiple disabilities who communicate through mostly presymbolic means display idiosyncratic communicative behavior that may not be recognized as communicative or interpreted correctly by some communication partners. This lack of correct interpretation eliminates the potential of a response from these communication
partners that is supportive of a high quality of life or the development of symbolic language. When those communication partners are school peers, there may be consequences for social development as well. This study represented an initial attempt to address this problem by training peers to interpret the idiosyncratic communicative behavior of three middle school students with multiple disabilities. Video, practice, and instructor feedback were used to provide peer participants with knowledge about the specific communicative behaviors of the students with multiple disabilities. Results suggest middle school peers can quickly learn to interpret the behavior of individuals with multiple disabilities. More research is needed to ensure the increase in communication partner knowledge translates to an increase in interaction success.
References


APPENDIX A

Illustration of Video Clip Organization

Original clips of each behavior:

<table>
<thead>
<tr>
<th></th>
<th>CB #1</th>
<th>CB #2</th>
<th>NC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alyse</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Van</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Frankie</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Breakdown of clips following blocked randomization:

<table>
<thead>
<tr>
<th>Probe #1</th>
<th>Probe #2</th>
<th>Probe #3</th>
<th>Training</th>
</tr>
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<tbody>
<tr>
<td>Alyse, CB #1</td>
<td>Alyse, CB #1</td>
<td>Alyse, CB #1</td>
<td>Alyse, CB #1</td>
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<tr>
<td>![ ]</td>
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<td>![ ]</td>
</tr>
<tr>
<td>Alyse, CB #2</td>
<td>Alyse, CB #2</td>
<td>Alyse, CB #2</td>
<td>Alyse, CB #2</td>
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<td>Alyse, NC</td>
<td>Alyse, NC</td>
<td>Alyse, NC</td>
<td>Alyse, NC</td>
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<td>![ ]</td>
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<tr>
<td>Van, CB #1</td>
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<td>Van, CB #1</td>
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<td>![ ]</td>
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<td>Van, CB #2</td>
<td>Van, CB #2</td>
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<td>Van, CB #2</td>
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<tr>
<td>Frankie, CB #1</td>
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<tr>
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<td>![ ]</td>
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<td>Frankie, NC</td>
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<td>![ ]</td>
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<td>![ ]</td>
</tr>
</tbody>
</table>
APPENDIX B

Probe Procedures

For probe 1: “We are going to look at videos of your friends from area buddies. In some of the videos, your friends are communicating. In other videos, they are not communicating. Communication can look like a lot of different things. For instance, right now I am speaking to communicate. But, people communicate in other ways too. For instance, sometimes I wave my hand to say ‘hello.’ There are 18 videos, but each one is going to play twice. That’s because they are very short and we don’t want you to miss anything. After we watch each video the second time, you will choose here [point to portion on response form] if the person in the video is communicating or not. If you decide they are communicating, you will then write what it is the person is communicating [point to portion on response form]. For example, if I were to show a video of me giving a “thumbs up” you might write, “Good job!” because that’s what I would be saying. Or, if I were to show a video of me saying “What’s up?”, you would write “What’s up?”. Finally, you will indicate how sure you are about the decision you make for each video. You may hear music or other people in the background. Try to ignore that and just pay attention to what the person in the video is doing.”

For probes 2 & 3: “We are going to look at videos again like before. Again, after we watch each video twice, you will decide if the person in the video is communicating, and, if so, what they are communicating. You will also indicate how sure you are about the decision you make for each video. You may hear music or other people in the background. Try to ignore that and just pay attention to what the person in the video is doing.”

For each clip (1-18)

- Play video
- Let the video play 2 times
- Pause the video after it plays a second time
- Wait at least 3 s
- If the person is not yet writing on response form, provide a prompt to do so (e.g., “So what do you think? Was the person communicating?” and point to the form)
- Monitor response until all 3 steps are complete, then navigate to the next clip

NOTE:
- Do not provide any feedback about the accuracy of responses; however, it is OK to provide positive feedback relative to completing the task
- If a student asks to see a video again, let them know unfortunately you are unable to do that
- If a student asks a question about their answer, let them know you can’t tell them the answer or give them any more information, but it’s OK to guess if they don’t know and they will learn more about it later
- If a student asks about spelling, you can help them with spelling and/or tell them that spelling doesn’t matter for this
APPENDIX C

Probe Response Form

Clip #1
Was the person communicating? Circle one: Yes No

If yes, what was the person communicating? _______________________

How sure are you about your decision?
1 2 3 4 5 6 7

I just guessed I am sure

Clip #2
Was the person communicating? Circle one: Yes No

If yes, what was the person communicating? _______________________

How sure are you about your decision?
1 2 3 4 5 6 7

I just guessed I am sure

Clip #3
Was the person communicating? Circle one: Yes No

If yes, what was the person communicating? _______________________

How sure are you about your decision?
1 2 3 4 5 6 7

I just guessed I am sure

Clip #4
Was the person communicating? Circle one: Yes No

If yes, what was the person communicating? _______________________

How sure are you about your decision?
1 2 3 4 5 6 7

I just guessed I am sure
Clip #5
Was the person communicating? Circle one: Yes No
If yes, what was the person communicating? _______________________
How sure are you about your decision?
I just guessed I am sure

Clip #6
Was the person communicating? Circle one: Yes No
If yes, what was the person communicating? _______________________
How sure are you about your decision?
I just guessed I am sure

Clip #7
Was the person communicating? Circle one: Yes No
If yes, what was the person communicating? _______________________
How sure are you about your decision?
I just guessed I am sure

Clip #8
Was the person communicating? Circle one: Yes No
If yes, what was the person communicating? _______________________
How sure are you about your decision?
I just guessed I am sure
Clip #9
Was the person communicating? Circle one: Yes No
If yes, what was the person communicating? ______________________
How sure are you about your decision?
I just guessed I am sure

Clip #10
Was the person communicating? Circle one: Yes No
If yes, what was the person communicating? ______________________
How sure are you about your decision?
I just guessed I am sure

Clip #11
Was the person communicating? Circle one: Yes No
If yes, what was the person communicating? ______________________
How sure are you about your decision?
I just guessed I am sure

Clip #12
Was the person communicating? Circle one: Yes No
If yes, what was the person communicating? ______________________
How sure are you about your decision?
I just guessed I am sure
Clip #13
Was the person communicating? Circle one: Yes No
If yes, what was the person communicating? _______________________
How sure are you about your decision?
I just guessed I am sure
1 2 3 4 5 6 7

Clip #14
Was the person communicating? Circle one: Yes No
If yes, what was the person communicating? _______________________
How sure are you about your decision?
I just guessed I am sure
1 2 3 4 5 6 7

Clip #15
Was the person communicating? Circle one: Yes No
If yes, what was the person communicating? _______________________
How sure are you about your decision?
I just guessed I am sure
1 2 3 4 5 6 7

Clip #16
Was the person communicating? Circle one: Yes No
If yes, what was the person communicating? _______________________
How sure are you about your decision?
I just guessed I am sure
1 2 3 4 5 6 7
Clip #17
Was the person communicating? Circle one:         Yes          No
If yes, what was the person communicating? _________________________
How sure are you about your decision?
I just guessed                      I am sure
1   2   3   4   5   6   7

Clip #18
Was the person communicating? Circle one:         Yes          No
If yes, what was the person communicating? _________________________
How sure are you about your decision?
I just guessed                      I am sure
1   2   3   4   5   6   7
APPENDIX D

Probe Procedural Fidelity Checklist

At the beginning of the session

Introduces the task:

Position tablet toward participant:

Repeated for clips 1-18

Clip #1:
Play video, letting it play twice:
Pause video on blue screen:
Wait at least 3 s:
Provide a prompt to respond, if needed:
Provide prompt to complete any steps, if needed:
Do not provide feedback on accuracy:

Clip #2:
Play video, letting it play twice:
Pause video on blue screen:
Wait at least 3 s:
Provide a prompt to respond, if needed:
Provide prompt to complete any steps, if needed:
Do not provide feedback on accuracy:

Clip #3:
Play video, letting it play twice:
Pause video on blue screen:
Wait at least 3 s:
Provide a prompt to respond, if needed:
Provide prompt to complete any steps, if needed:
Do not provide feedback on accuracy:

Clip #4:
Play video, letting it play twice:
Pause video on blue screen:
Wait at least 3 s:
Provide a prompt to respond, if needed:
Provide prompt to complete any steps, if needed:
Do not provide feedback on accuracy:
Clip #5:
Play video, letting it play twice:
Pause video on blue screen:
Wait at least 3 s:
Provide a prompt to respond, if needed:
Provide prompt to complete any steps, if needed:
Do not provide feedback on accuracy:

Clip #6:
Play video, letting it play twice:
Pause video on blue screen:
Wait at least 3 s:
Provide a prompt to respond, if needed:
Provide prompt to complete any steps, if needed:
Do not provide feedback on accuracy:

Clip #7:
Play video, letting it play twice:
Pause video on blue screen:
Wait at least 3 s:
Provide a prompt to respond, if needed:
Provide prompt to complete any steps, if needed:
Do not provide feedback on accuracy:

Clip #8:
Play video, letting it play twice:
Pause video on blue screen:
Wait at least 3 s:
Provide a prompt to respond, if needed:
Provide prompt to complete any steps, if needed:
Do not provide feedback on accuracy:

Clip #9:
Play video, letting it play twice:
Pause video on blue screen:
Wait at least 3 s:
Provide a prompt to respond, if needed:
Provide prompt to complete any steps, if needed:
Do not provide feedback on accuracy:
Clip #10:
Play video, letting it play twice:
Pause video on blue screen:
Wait at least 3 s:
Provide a prompt to respond, if needed:
Provide prompt to complete any steps, if needed:
Do not provide feedback on accuracy:

Clip #11:
Play video, letting it play twice:
Pause video on blue screen:
Wait at least 3 s:
Provide a prompt to respond, if needed:
Provide prompt to complete any steps, if needed:
Do not provide feedback on accuracy:

Clip #12:
Play video, letting it play twice:
Pause video on blue screen:
Wait at least 3 s:
Provide a prompt to respond, if needed:
Provide prompt to complete any steps, if needed:
Do not provide feedback on accuracy:

Clip #13:
Play video, letting it play twice:
Pause video on blue screen:
Wait at least 3 s:
Provide a prompt to respond, if needed:
Provide prompt to complete any steps, if needed:
Do not provide feedback on accuracy:

Clip #14:
Play video, letting it play twice:
Pause video on blue screen:
Wait at least 3 s:
Provide a prompt to respond, if needed:
Provide prompt to complete any steps, if needed:
Do not provide feedback on accuracy:
Clip #15:
Play video, letting it play twice:  
Pause video on blue screen: 
Wait at least 3 s: 
Provide a prompt to respond, if needed: 
Provide prompt to complete any steps, if needed: 
Do not provide feedback on accuracy: 

Clip #16:
Play video, letting it play twice:  
Pause video on blue screen: 
Wait at least 3 s: 
Provide a prompt to respond, if needed: 
Provide prompt to complete any steps, if needed: 
Do not provide feedback on accuracy: 

Clip #17:
Play video, letting it play twice:  
Pause video on blue screen: 
Wait at least 3 s: 
Provide a prompt to respond, if needed: 
Provide prompt to complete any steps, if needed: 
Do not provide feedback on accuracy: 

Clip #18:
Play video, letting it play twice:  
Pause video on blue screen: 
Wait at least 3 s: 
Provide a prompt to respond, if needed: 
Provide prompt to complete any steps, if needed: 
Do not provide feedback on accuracy: 

Total correct steps: _________________ / Total needed steps: _________________

= _________________ x 100 = _________________ % Procedural Fidelity
“OK, now we are going to look at more videos of your friends in this class. Only this time, we are going to decide together if the videos are communication and what they mean. I talked to the students’ parents and teacher, so I know what each video means. I want to teach you what it means so that when you interact with [Alyse], [Van], and [Frankie], you can recognize when they communicate and respond to it. I think this will make Area Buddies more fun for you, and will make school more fun for [Alyse], [Van], and [Frankie], too. What do you think – is this something you are interested in trying to learn? [wait for commitment] Great! You are going to learn two different types of communication for [Alyse], [Van], and [Frankie]. I will help you the first time a new communication comes up in the video. After that, you can practice recognizing it. We will watch each video twice before we decide what we saw. Let’s look at videos of [Alyse] first.”

For initial video of “That’s funny”:

- Play video
- Pause after first playing of clip
- Label communication as “That’s funny” and provide operational definition for recognizing:
  - She’s smiling
  - Her hands are moving
  - Sometimes, she laughs too
- Replay video
- Program hotspot
- Navigate to next video
For initial video of “I’m unhappy”:

- Play video
- Pause after first playing of clip
- Label communication as “I’m unhappy” and provide operational definition for recognizing:
  - Her eyebrows are lowered
  - Her hands are moving
  - Sometimes she groans too
- Replay video
- Program hotspot
- Navigate to next video

“OK. Now we are going to look at more videos of [Alyse]. In some of the videos, [Alyse] is communicating “That’s funny,” in some of the videos she is communicating “I’m unhappy,” and in other videos she is not communicating at all. We will watch each video twice. You will decide if and what she is communicating for each video. Then you can program the audio for the videos.”

For remaining videos:

- Play video
- Replay video
- Provide feedback: positive or corrective
- Support student in creating the hotspot for all videos of communication, as needed

Video Training, Part 2

“OK, now let’s look at videos of [Van].”

For initial video of “Yes, I want it”:

- Play video
- Pause after first playing of clip
- Label communication as “Yes, I want it” and provide operational definition for recognizing:
  o He hums
  o He moves his head down
- Replay video
- Program hotspot
- Navigate to next video

For initial video of “I want the ball”:
- Play video
- Pause after first playing of clip
- Label communication as “I want the ball” and provide operational definition for recognizing:
  o He says “bow”
- Replay video
- Program hotspot
- Navigate to next video

“OK. Now we are going to look at more videos of [Van]. In some of the videos, [Van] is communicating that confirming that “yes” he wants something,” in some of the videos he is communicating “ball,” and in other videos he is not communicating at all. We will watch each video twice. You will decide what, if anything, he is communicating for each video.”

For remaining videos:
- Play video
- Replay video
- Provide feedback: positive or corrective
- Support student in creating the hotspot for all videos of communication, as needed
Video Training, Part 3

“OK, now let’s look at videos of [Frankie].”

For initial video of “I want it”:
- Play video
- Pause after first playing of clip
- Label communication as “I want it” and provide operational definition for recognizing:
  - She is reaches her arm out for something or someone
  - She moves her hand
- Replay video
- Program hotspot
- Navigate to next video

For initial video of “I don’t want it”:
- Play video
- Pause after first playing of clip
- Label communication as “I don’t want it” and provide operational definition for recognizing:
  - She pushes the thing/person away or drops the thing
  - For [Frankie], it is important to watch her arms and hands to tell what/if she is communicating
- Replay video
- Program hotspot
- Navigate to next video
“OK. Now we are going to look at more videos of [Frankie]. In some of the videos, [Frankie] is communicating “I want it,” in some of the videos she is communicating “I don’t want it,” and in other videos she is not communicating at all. We will watch each video twice. You will decide what, if anything, she is communicating for each video.”

For remaining videos:

- Play video
- Replay video
- Provide feedback: positive or corrective
- Support student in creating the hotspot for all videos of communication, as needed
APPENDIX F

Intervention Procedural Fidelity Checklist

Beginning of the training
Introduce the training:
Provide opportunity to express buy-in:
Position tablet toward participant:

Repeated for training blocks 1-3

Block #1:
Play video #1:
Pause after first viewing:
Label with linguistic map (“That’s funny”):
Provide operational definition (smiling, hands moving):
Replay video:
Program hotspot with linguistic map:

Play video #2:
Pause after first viewing:
Label with linguistic map (“I’m unhappy”):
Provide operational definition (eyebrows down, hands moving):
Replay video:
Program hotspot with linguistic map:

Inform participants that they will decide for remaining videos:

Play video #3, letting it play twice:
Pause after second viewing:
Wait at least 3 s:
Ask or prompt for participant judgment, if needed:
Provide feedback on accuracy of judgement:
Prompt for hotspot of linguistic map, if needed:
Provide feedback on accuracy of map:

Play video #4, letting it play twice:
Pause after second viewing:
Wait at least 3 s:
Ask or prompt for participant judgment, if needed:
Provide feedback on accuracy of judgement:
Prompt for hotspot of linguistic map, if needed:
Provide feedback on accuracy of map:

Play video #5, letting it play twice:
Pause after second viewing:
Wait at least 3 s:
Ask or prompt for participant judgment, if needed:
Provide feedback on accuracy of judgement:
Prompt for hotspot of linguistic map, if needed:
Provide feedback on accuracy of map:
Play video #6, letting it play twice:
Pause after second viewing:
Wait at least 3 s:
Ask or prompt for participant judgment, if needed:
Provide feedback on accuracy of judgement:
Prompt for hotspot of linguistic map, if needed:
Provide feedback on accuracy of map:

Play video #7, letting it play twice:
Pause after second viewing:
Wait at least 3 s:
Ask or prompt for participant judgment, if needed:
Provide feedback on accuracy of judgement:
Prompt for hotspot of linguistic map, if needed:
Provide feedback on accuracy of map:

Play video #8, letting it play twice:
Pause after second viewing:
Wait at least 3 s:
Ask or prompt for participant judgment, if needed:
Provide feedback on accuracy of judgement:
Prompt for hotspot of linguistic map, if needed:
Provide feedback on accuracy of map:

Play video #9, letting it play twice:
Pause after second viewing:
Wait at least 3 s:
Ask or prompt for participant judgment, if needed:
Provide feedback on accuracy of judgement:
Prompt for hotspot of linguistic map, if needed:
Provide feedback on accuracy of map:

Play video #10, letting it play twice:
Pause after second viewing:
Wait at least 3 s:
Ask or prompt for participant judgment, if needed:
Provide feedback on accuracy of judgement:
Prompt for hotspot of linguistic map, if needed:
Provide feedback on accuracy of map:
Block #2:
Play video #1:
Pause after first viewing:
Label with linguistic map (“Yes, I want it”):
Provide operational definition (moves head down, hums):
Replay video:
Program hotspot with linguistic map:

Play video #2:
Pause after first viewing:
Label with linguistic map (“I want the ball”):
Provide operational definition (says “bow”):
Replay video:
Program hotspot with linguistic map:

Inform participants that they will decide for remaining videos:

Play video #3, letting it play twice:
Pause after second viewing:
Wait at least 3 s:
Ask or prompt for participant judgment, if needed:
Provide feedback on accuracy of judgement:
Prompt for hotspot of linguistic map, if needed:
Provide feedback on accuracy of map:

Play video #4, letting it play twice:
Pause after second viewing:
Wait at least 3 s:
Ask or prompt for participant judgment, if needed:
Provide feedback on accuracy of judgement:
Prompt for hotspot of linguistic map, if needed:
Provide feedback on accuracy of map:

Play video #5, letting it play twice:
Pause after second viewing:
Wait at least 3 s:
Ask or prompt for participant judgment, if needed:
Provide feedback on accuracy of judgement:
Prompt for hotspot of linguistic map, if needed:
Provide feedback on accuracy of map:
Play video #6, letting it play twice:
Pause after second viewing:
Wait at least 3 s:
Ask or prompt for participant judgment, if needed:
Provide feedback on accuracy of judgement:
Prompt for hotspot of linguistic map, if needed:
Provide feedback on accuracy of map:

Play video #7, letting it play twice:
Pause after second viewing:
Wait at least 3 s:
Ask or prompt for participant judgment, if needed:
Provide feedback on accuracy of judgement:
Prompt for hotspot of linguistic map, if needed:
Provide feedback on accuracy of map:

Play video #8, letting it play twice:
Pause after second viewing:
Wait at least 3 s:
Ask or prompt for participant judgment, if needed:
Provide feedback on accuracy of judgement:
Prompt for hotspot of linguistic map, if needed:
Provide feedback on accuracy of map:

Play video #9, letting it play twice:
Pause after second viewing:
Wait at least 3 s:
Ask or prompt for participant judgment, if needed:
Provide feedback on accuracy of judgement:
Prompt for hotspot of linguistic map, if needed:
Provide feedback on accuracy of map:

Play video #10, letting it play twice:
Pause after second viewing:
Wait at least 3 s:
Ask or prompt for participant judgment, if needed:
Provide feedback on accuracy of judgement:
Prompt for hotspot of linguistic map, if needed:
Provide feedback on accuracy of map:
Block #1:
Play video #1:
Pause after first viewing:
Label with linguistic map ("I want it"): Provide operational definition (reaches arm, moves hand):
Replay video:
Program hotspot with linguistic map:

Play video #2:
Pause after first viewing:
Label with linguistic map ("I don’t want it"): Provide operational definition (pushes away or drops object):
Replay video:
Program hotspot with linguistic map:

Inform participants that they will decide for remaining videos:

Play video #3, letting it play twice:
Pause after second viewing:
Wait at least 3 s:
Ask or prompt for participant judgment, if needed:
Provide feedback on accuracy of judgement:
Prompt for hotspot of linguistic map, if needed:
Provide feedback on accuracy of map:

Play video #4, letting it play twice:
Pause after second viewing:
Wait at least 3 s:
Ask or prompt for participant judgment, if needed:
Provide feedback on accuracy of judgement:
Prompt for hotspot of linguistic map, if needed:
Provide feedback on accuracy of map:

Play video #5, letting it play twice:
Pause after second viewing:
Wait at least 3 s:
Ask or prompt for participant judgment, if needed:
Provide feedback on accuracy of judgement:
Prompt for hotspot of linguistic map, if needed:
Provide feedback on accuracy of map:
Play video #6, letting it play twice:
Pause after second viewing:
Wait at least 3 s:
Ask or prompt for participant judgment, if needed:
Provide feedback on accuracy of judgement:
Prompt for hotspot of linguistic map, if needed:
Provide feedback on accuracy of map:

Play video #7, letting it play twice:
Pause after second viewing:
Wait at least 3 s:
Ask or prompt for participant judgment, if needed:
Provide feedback on accuracy of judgement:
Prompt for hotspot of linguistic map, if needed:
Provide feedback on accuracy of map:

Play video #8, letting it play twice:
Pause after second viewing:
Wait at least 3 s:
Ask or prompt for participant judgment, if needed:
Provide feedback on accuracy of judgement:
Prompt for hotspot of linguistic map, if needed:
Provide feedback on accuracy of map:

Play video #9, letting it play twice:
Pause after second viewing:
Wait at least 3 s:
Ask or prompt for participant judgment, if needed:
Provide feedback on accuracy of judgement:
Prompt for hotspot of linguistic map, if needed:
Provide feedback on accuracy of map:

Play video #10, letting it play twice:
Pause after second viewing:
Wait at least 3 s:
Ask or prompt for participant judgment, if needed:
Provide feedback on accuracy of judgement:
Prompt for hotspot of linguistic map, if needed:
Provide feedback on accuracy of map:

Total correct steps: _________________ / Total needed steps: _________________

= _________________ x 100 = _________________ % Procedural Fidelity
APPENDIX G

Professional Social Validity Questionnaire

1. It is important for peers to be able to interact effectively with students in this class.
   Strongly Disagree                                Strongly Agree
   1   2   3   4   5

2. The peers appeared interested in the training.
   Strongly Disagree                                Strongly Agree
   1   2   3   4   5

3. The peers benefited from the training.
   Strongly Disagree                                Strongly Agree
   1   2   3   4   5

4. I would implement the training with peers in the future.
   Strongly Disagree                                Strongly Agree
   1   2   3   4   5

5. I noticed communication between students in area buddies improve after the video training.
   Strongly Disagree                                Strongly Agree
   1   2   3   4   5

6. The students with multiple disabilities appear to enjoy area buddies more after the training.
<table>
<thead>
<tr>
<th>Strongly Disagree</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td></td>
</tr>
</tbody>
</table>
APPENDIX H

Peer Social Validity Questionnaire

1. It is important for me to communicate effectively with the students in area buddies.
   Strongly Disagree  Strongly Agree
   1  2  3  4  5

2. I liked the training.
   Strongly Disagree  Strongly Agree
   1  2  3  4  5

3. I learned from the training.
   Strongly Disagree  Strongly Agree
   1  2  3  4  5

4. I still remember what I learned from the training.
   Strongly Disagree  Strongly Agree
   1  2  3  4  5

5. I recognize more communication from the students since the training.
   Strongly Disagree  Strongly Agree
   1  2  3  4  5

6. I have used something I’ve learned from the training while interacting during area buddies.
   Strongly Disagree  Strongly Agree
   1  2  3  4  5

7. I am able to communicate more effectively with the students after the training.
   Strongly Disagree  Strongly Agree
8. I enjoy area buddies even more after the training.

Strongly Disagree                               Strongly Agree

1        2        3        4        5

9. My favorite part about the training was:

10. One suggestion I have for the training is:
APPENDIX I

R Input

############################ Power Analysis ############################

library(pwr)
pwr.anova.test(k = 2, n = NULL, f = 0.7, sig.level = 0.05, power = 0.8)

############################ Main Results ############################

DATA <- read.csv(file.choose(),header=TRUE)

DATA

boxplot(DATA$Gain.Score ~ DATA$Group)

anova <- aov(DATA$Gain.Score ~ DATA$Group)
supplyy(anova)

############################ QQ Plot ############################

attach(DATA)

qqnorm(Gain.Score)

qqline(Gain.Score)
library(reshape2)

library(car)

leveneTest(Gain.Score ~ Group, DATA)
APPENDIX J

R Output

> library(pwr)
> pwr.anova.test(k = 2, n = 10, f = 0.7, sig.level = 0.05, power = NULL)

Balanced one-way analysis of variance power calculation

k = 2
n = 9.077682
f = 0.7
sig.level = 0.05
power = 0.8

NOTE: n is number in each group

> DATA
   Gain.Score Group
     1      13 Experimental
     2       9 Experimental
     3       8 Experimental
     5      14 Experimental
     6       7 Experimental
     7       6 Experimental
     8      12 Experimental
     9      11 Experimental
    10       9 Experimental
    11       6 Experimental
    12      11 Experimental
    13       2    Control
    14       -3 Control
    15       -1 Control
    16        0 Control
    17       -5 Control
    18       -5 Control
    19        1 Control
    20        5 Control
    21        1 Control
    22       -2 Control
    23       -1 Control
    24        1 Control

> attach(DATA)
> boxplot(DATA$Gain.Score ~ DATA$Group)
> qqnorm(Gain.Score)
> qqline(Gain.Score)

> anova <- aov(DATA$Gain.Score ~ DATA$Group)
> summary(anova)

Df  Sum Sq Mean Sq  F value    Pr(>F)
DATA$Group  1 610.00  610.0 78.0719 1.09e-08 ***
Residuals 22 171.92   7.8

Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

> library(reshape2)
> library(car)
> `leveneTest(Gain.Score ~ Group, DATA)`
Levene's Test for Homogeneity of Variance (center = median)

<table>
<thead>
<tr>
<th></th>
<th>Df</th>
<th>F value</th>
<th>Pr(&gt;F)</th>
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</thead>
<tbody>
<tr>
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<td>0.901</td>
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> `Pre_Data <- read.csv(file.choose(),header=TRUE)`

> `Pre_Data`

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<tbody>
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<tr>
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<td>Experimental</td>
</tr>
<tr>
<td>8</td>
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<td>4</td>
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<td>9</td>
<td>Control</td>
</tr>
<tr>
<td>7</td>
<td>Control</td>
</tr>
</tbody>
</table>

> `attach(Pre_Data)`

> `t.test(Score ~ Group)`
CHRISTINE HOLYFIELD

Curriculum Vitae

EDUCATION

Doctor of Philosophy
Communication Sciences and Disorders
Pennsylvania State University
University Park, PA

Master of Arts
Communication Sciences and Disorders
University of Kansas
Lawrence, KS

Bachelor of Science
Communication Sciences and Disorders; Psychology
Central Michigan University
Mount Pleasant, MI

CERTIFICATION

Certificate of Clinical Competence in Speech-Language Pathology (CCC-SLP)
American Speech-Language-Hearing Association (ASHA)

SELECT AWARDS AND HONORS

Emerging Researcher Award
International Society for Augmentative and Alternative Communication
Award for $1000 honoring emerging international leaders in AAC research

Maryann Peins Graduate Scholarship in Speech Pathology
Pennsylvania State University
Award for $2600 honoring one graduate student in speech-language pathology a year for his or her academic distinction

SELECTED PEER-REVIEWED PUBLICATIONS

SELECTED PEER-REVIEWED PRESENTATIONS