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#### AN EXPLORATORY STUDY OF THE ASSOCIATIVE RELATIONSHIPS BETWEEN FAMILY PARADIGMS ANDAUGMENTATIVE AND ALTERNATIVE COMMUNICATION SATISFACTION IN FAMILIES WITH YOUNG CHILDREN

presented by

Mary Josephine Cooley Hidecker

has been accepted towards fulfillment of the requirements for the

degree in

Ph.D.

Audiology and Speech Sciences

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## AN EXPLORATORY STUDY OF THE ASSOCIATIVE RELATIONSHIPS BETWEEN FAMILY PARADIGMS AND AUGMENTATIVE AND ALTERNATIVE COMMUNICATION SATISFACTION IN FAMILIES WITH YOUNG CHILDREN

By

Mary Josephine Cooley Hidecker

## A DISSERTATION

Submitted to Michigan State University in partial fulfillment of the requirements for the degree of

### DOCTOR OF PHILOSOPHY

Audiology and Speech Sciences

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#### ABSTRACT

## AN EXPLORATORY STUDY OF THE ASSOCIATIVE RELATIONSHIPS BETWEEN FAMILY PARADIGMS AND AUGMENTATIVE AND ALTERNATIVE COMMUNICATION SATISFACTION IN FAMILIES WITH YOUNG CHILDREN

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Mary Josephine Cooley Hidecker

Family involvement in augmentative and alternative communication (AAC) is important, especially with a toddler or preschooler. This study examined AAC family satisfaction within the framework of family paradigms, which states that families view their environments in paradigmatically different ways. The view from a paradigm, (i.e., closed, random, open, and synchronous), guides families in using resources of time, space, energy, and material in the pursuit of their goals of control, affect, meaning, and content.

Closed paradigms involve strategies that follow traditions, conserve resources, and reinforce loyalty to one's family. Random paradigms involve strategies that seek innovation, expend resources with zest, and encourage individual freedom. Open paradigms involve strategies that create collaborative action, balance group and individual needs for resources, and communicate practicality. Synchronous paradigms involve strategies that ground family constancy, maintain resources, and connect with the timeless universals of life. More than one paradigm can be used by a family.

In this study, participants were 54 primary caregivers from 27 different states. The 55 children, aged 15 to 75 months, had not yet started kindergarten, had used the then current AAC system for six to 24 months, and had a variety of developmental disorders resulting in a severe communication disorder. Most had multimodal AAC systems, which included both aided and unaided components although 11 had only the unaided AAC

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system of sign language. More than half of the AAC systems included a voice output component. Sign language was the most frequently used AAC within the child's home.

The primary caregivers, all mothers, completed an 81-question case history and a 10-question instrument, the *AAC Family-Paradigm Assessment Scale (AACF-PAS)*, which was adapted from earlier scales that identified family paradigms that guide family behavior. The *AACF-PAS* results from 42 families revealed that 33% frequently used a closed paradigm, 48% frequently used a random paradigm, 76% frequently used a open paradigm, and 10% frequently used a synchronous paradigm, with one half of the families frequently combining family paradigms.

In contrast to those results, closed (36%), random (57%), and open (55%) paradigms were most frequently remembered when caregivers provided a retrospective judgment of their family functioning from the period of time before the child's diagnosis. However, after the child's diagnosis, closed and open paradigms were used by more families while random paradigm decreased. After AAC implementation, families reported increased reliance on random and open while decreasing closed strategies. This trend continued when families identified a hypothetical, ideal method of family functioning.

The primary caregivers were generally satisfied with the child's AAC system. Families who started with random paradigms before the child was diagnosed and/or who ideally desired random paradigms were more likely to be satisfied with their AAC system. In contrast, families who more frequently used a closed paradigm at the time of the study were more likely to be dissatisfied with their AAC system. Additional demographics, future research directions, and clinical implications are also discussed.

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# **DEDICATION**

To my husband Jeff

who always believed.

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#### **CHAPTER 1**

Introduction and Review of the Literature

Many have recognized the importance of family involvement in augmentative and alternative communication (AAC) intervention (Angelo, 2000; Angelo, Jones, & Kokoska, 1995; Cress, 2004; Parette, VanBiervliet, & Hourcade, 2000; Sweeney, 1999). However, Parette and Angelo (1996) suggested that, historically, AAC practices have focused more on the role of service providers and less on the role of families in assisting AAC users to become competent communicators. In order to change this mindset, professionals need to understand AAC users within the context of their families' beliefs and preferences, but little is known about which family features contribute to successful and satisfied AAC users and families. Therefore, examining theories of family functioning may provide organizing frameworks to explore this area of research. Hence, the field of AAC may benefit by using family theories to identify and test potentially-important family variables (Sweeney, 1999). *The Importance of Families* 

Families play critical roles in children's early communication development (Andrews & Andrews, 2000; Chapman, 2000; Donahue-Kilburg, 1992; Gillette, 2000). Early social interactions often require parents and other communication partners to ascribe meaning to the child's behavior. However, a child's developmental delays, due to cognitive and/or physical limitations, can interfere with the communication partner's responsivity (Harwood, Warren, & Yoder, 2002; Siegel & Cress, 2002). The partner may be unsuccessful in recognizing and/or interpreting the child's behavior and vocalizations.

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Decreasing these communication breakdowns between the child and his or her parent may prevent or lessen the severity of the communication disorder.

Some professionals have advocated using AAC to clarify and expand the child's communicative repertoire in order to increase the communication partner's responsivity and the child's communication successes (Cress, 2002; Light, Parsons, & Drager, 2002). AAC tools encompass a wide assortment of symbols, aids, strategies, and techniques (American Speech-Language-Hearing Association, 1991) that are matched to the AAC user's strengths and needs. This process of feature-matching AAC components to an AAC user is often used to develop a multimodal AAC system (Glennen & DeCoste, 1997). Inserting a step into the AAC evaluation, in which family features are also matched to AAC components and recommendations, might enhance successful AAC implementation within the family (Judge & Parette, 1998). Feature-matching to the family may also assist in the prevention of increased family stress (Judge & Parette, 1998) and subsequent technology discontinuance by the AAC user and family (Phillips & Zhao, 1993).

Believing that there is only one ideal version of family functioning is a mistake that some researchers and clinicians make (Kantor & Lehr, 1975). This belief can lead to frustrated professionals and disheartened families. Alternatively, some professionals (Constantine, 1986; Crais, 1991; Imig, 2000a; McWilliam, Tocci, & Harbin, 1998; Parette et al., 2000) believe that they are obligated to assist a family in ways that are important to the family. This fundamental principle underlies numerous terms, including familycentered, family-focused, family-directed, family-enabled, and family-empowered (Crais, 1991), that have been used in the literature of early intervention and of communication disorders. (Note: Family-centered will be used in this paper to represent the principle.)

Given means centerd The Ti 1975) h functior this cha<sub>f</sub> show's h (Constar resources importan may then require th Kantor & Н and synch to introdu <sup>although</sup>, <sup>details</sup> abo later sectio <sup>all</sup> tables ar Given the complexity of family dynamics, professionals must find effective and efficient means to determine what a particular family views as important if the principle of familycentered practices is to become widespread.

#### The Theory of Family Paradigms

The theory of family paradigms (Constantine, 1986; Imig, 2000a; Kantor & Lehr, 1975) has been used by family science professionals to determine individual family functioning. Its variables may be relevant to AAC intervention as will be discussed later in this chapter. Family paradigms are based on qualitative and quantitative research, which shows how people view the world in very different ways, leading to different behaviors (Constantine, 1986; Imig, 2000a; Kantor & Lehr, 1975). While all families use their resources to obtain their desired outcomes, each family can differ in its view of what is important and how to accomplish its goals. Using this theoretical perspective, professionals may then help a family integrate AAC recommendations into its current paradigm and not require the family to change its view of what is important (Constantine, 1986; Imig, 2000a; Kantor & Lehr, 1975) for the sake of the AAC recommendations.

Historically, four family paradigms have been described as closed, random, open, and synchronous (Constantine, 1986, 1993a; Imig, 2000a; Kantor & Lehr, 1975). In order to introduce this theory, each of the four paradigms will be described as a distinct category, although, in many cases, families may live as a combination of paradigms. Additional details about the specific types of resources and goals that families use will be presented in later sections of this chapter. (See Figure 1 for a diagram of family functioning. Note that all tables and figures are in Appendix A.)

Families that prefer stable, predictable use of their resources to obtain traditional, time-honored goals are employing a structured or *closed* family paradigm. These families follow the directions of the head of the family. They prefer routines and predictable, steady, efficient use of their resources.

Families that prefer spontaneous, individual use of their resources in order to obtain individual, innovative goals are applying a spontaneous or *random* paradigm. These families value individuals pursuing interesting, inventive goals.

Families that prefer practical use of their resources to achieve consensus goals are implementing a negotiated or *open* paradigm. These families will decide on goals by discussion leading to consensus.

Families that understand each other so well that words are not needed are said to be unconsciously connected or *synchronous*. These families appear to have little need for overt communication as each one "just knows" what to do in order to achieve successful family functioning.

In all families, the resources of time, space, energy, and material are constantly being expended by family members to accomplish their goals of control, affect, meaning, and content (see Figure 1). The results of these expenditures are evaluated by the family member(s) through feedback mechanisms. Gathering and evaluating feedback about their resource use and goal attainment will assist families in rebalancing those elements. For example, one family may believe that volunteering to help at a homeless shelter is a meaningful goal. The family members will monitor and decide on how much time, energy, and material donations should be expended. If the meaning of this activity is very important and does not interfere with other family goals, the family is likely to expend more

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resources. However, if the family feels that other important goals are not being accomplished or that it does not have enough resources for all its goals, then one family might devote less time, energy, and/or material goods to the homeless shelter. Another family might recruit more families and friends to use their resources for the shelter, thus creating additional resources for the homeless shelter.

Family members will use one or more of the four *player parts*, mover, challenger, follower, and bystander, within their personal interactions (Constantine, 1986; Imig, 2000a; Kantor & Lehr, 1975). *Movers* initiate actions. In contrast, *challengers* tend to resist the actions of the movers. *Followers* tend to follow the actions of the movers. *Bystanders* prefer to reflect on the various actions. More details about player parts will be presented later in this chapter.

The family's behavior is also dependent on the larger contexts of the environments in which they live, including natural, human-constructed, and social-cultural venues (Bubolz & Sontag, 1993). The natural environment includes physical or biological forms that are unaltered by humans such as air, climate, plants, animals, and water. The humanconstructed environment consists of all things humans have built or transformed from the natural environment in order to achieve human goals. Some elements of the humanconstructed environment include buildings, farmland, cities, roads, pollution, electricity, and technology. The social-cultural environment includes how people live in community together; what types of economies are created; and what types of culture, such as laws, customs, language, and social norms, are developed. Thus, within these multiple environments, the dynamic family system will try to adjust its use of goals and resources in order to better match its preferred methods of functioning.

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Consider the decision-making process that a family may implement to accomplish the goal of feeding the children. In one case, a family member could spend all day cooking an elaborate meal. Depending on the natural location, supper might be animals and plants from the family's natural environment. The family member may decide that expending that amount of time and energy is an appropriate use of family resources since the outcome of feeding children homegrown and home-cooked meals is viewed as an important labor of love in the family.

In another family, however, a can of soup might be heated up for supper, requiring less time as long as the family has the human-constructed appliances of a can-opener and a microwave. This meal of soup would be viewed as appropriate if the family valued inexpensive, quick feeding of its members. In a third case, a family member could have a pizza delivered. The cost of the pizza would have to come from the family's material resources but would require less immediate family energy expenditure. Pizza would have to be an appropriate food in the family's culture, and pizza delivery would need to exist within the physical proximity of the family's house.

In each of these cases, the family goal of feeding the children was accomplished. However, families with different paradigms will evaluate the same strategy as a more or less appropriate use of their resources that will bring them closer to or further from achieving their desired goals (Imig, 2000a; Villarruel, Imig, & Kostelnik, 1995)

*Family Paradigm Resources.* The theory of family paradigms proposes that people collect and expend their resources of *time*, *space*, *energy*, and *materials* (Constantine, 1986; Imig, 2000a). See Table 1 for a summary of resources by paradigm.

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The resource of time refers to how the family schedules its actual time. Using the concept of the closed paradigm, a family looks to the past for the stability and guidance found in following the family's traditional routines or methods. For example, the closed family might use the same routine with the children (e.g., 7 p.m. bath, 7:30 p.m. bedtime story, and 7:45 p.m. lights off) that the mother followed when she was growing up. On the other hand, the random paradigm is "organized as an aggregate of individual agendas"...carried out "according to whose individual priorities...[are] most relevant or appropriate at that particular moment" (Imig, 2000a, chap. 5, p. 3). For example, a child might stay up until midnight one night to work on an important school project, yet go to bed at 8 p.m. on another night because she is tired.

The open paradigm concept adapts to the consensual decision of what is practical and attempts to balance individual and family issues. For example, the family may hold a meeting to decide if a child should be allowed to stay up past her bedtime to watch a special television show. The concept of the synchronous paradigm "transcends the day-today pressures of life" by following "a plan characterized by simplicity and implicitly shared knowledge among family members" and flows with nature's rhythm (Imig, 2000a, chap. 5, p. 5). For example, the synchronous family might subconsciously adjust bedtimes with the changing length of daylight. Without overt communication, the child would know to go to bed at sunset.

The resource of space includes the use of both physical and interpersonal space (Constantine, 1986; Imig, 2000a). Physical space can be used to increase or decrease the distance among people. For example, being in the same room or leaving the family to go out for the evening is a physical space issue. Interpersonal space includes decisions on what

are acceptable ideas. The closed paradigm may draw strong physical boundaries between those in the family and those outside the family, and thus, certain rooms in the house are not to be shown to "outsiders." Closed families may have certain topics that are considered unacceptable to bring up in the family. The random paradigm may have fluid boundaries where anyone in the physical proximity is included in family activities. The random family would likely be encouraging of any topic. The open family can decide to change the use of physical space but only after discussion. Most topics are appropriate as long as the family can reach a consensus opinion. The synchronous family has implicit boundaries and acceptable topics. The family knows its membership by those who share its common understandings.

The energy resource, which is the intensity used for one's actions, must be obtained and dispersed to accomplish daily activities (Constantine, 1986; Imig, 2000a). The closed paradigm looks for steady, efficient use of available predictable energy. The random paradigm allows for fluctuating energy. Thus, sometimes energy will be abundant and, at other times, energy will be low because the family is overextended. The open paradigm seeks to create flexible energy. If the family needs to expend more energy, they will need to find more energy supplies. The synchronous paradigm's energy flows from its connection with nature. A synchronous energy example is the Chinese concept of chi, in which a person's energy is believed to be connected with the universe (Imig, 2000a, Ch. 5, p. 11)

Material goods raise questions about the roles and consumption of possessions and belongings of the family (Constantine, 1986; Imig, 2000a). The closed paradigm views material goods as rewards for effective effort. The random paradigm prefers to avoid material goods because of their potential to complicate relationships. The open paradigm

views material goods as resources to use in its pursuit of individual and familial goals. The synchronous paradigm values material goods that are perfect and timeless, which unconsciously reminds each family member of his or her connection with each other and with nature. For example, a synchronous family could display a pristine conch shell in a place of honor in its home, symbolizing the family's shared ocean connections.

*Family Paradigm Goals*. The theory of family paradigms proposes that people try to achieve the goals of *control*, *affect*, *meaning*, and *content* (Constantine, 1986; Imig, 2000a). See Table 2 for a summary of goals by paradigm.

The goal of control is to achieve the family's desired outcomes. The closed family develops plans that can be counted on in all situations. The random family allows individuals to determine what, when, and how to complete necessary tasks. The open family will discuss what, when, and how to best work together to accomplish the necessary actions. The synchronous family implicitly carries out the needed activities.

The goal of affect is for the families to express feelings including affection, caring, and support (Constantine, 1986; Imig, 2000a). The closed family prefers traditional, private expressions of caring. The random family seeks spontaneous and passionate expressions of caring. The open family desires authentic and responsive expressions of caring. The synchronous family considers explicit expressions of caring as unnecessary displays of what its members already unconsciously know.

The goal of meaning is to determine the value placed on different aspects of life (Constantine, 1986; Imig, 2000a). The closed family follows the "traditional" values of its culture. The random family values each individual member finding and following each one's vision. The open family constructs a shared meaning through an open discussion and consensus of its values. The synchronous family shares a common vision that arises from the members' similar views of their common experiences.

The goal of content is to make sense of the family's reality (Constantine, 1986; Imig, 2000a). The closed family believes reality is defined, objective, and absolute. The random family considers reality as individually-constructed and subjective. The open family views reality as combining the objective and subjective views in order to create a practical or useful truth. The synchronous family believes that individuals will each find the path to the same inevitable conclusion.

*Compromise and compound family paradigms*. Although family paradigms have thus far been presented as separate categories, family style is generally more complex than a single paradigm (Constantine, 1986; Imig, 2000a). Families may blend two or more paradigms, creating a *compromise* system, or each family member may rely on a different paradigm, yielding a *compound* system (Constantine, 1986, pp. 352-366; Imig, 2000a, Ch 9). For instance, a family may employ an open paradigm for time and energy issues with a random paradigm for space and material resources. If members agree with their use of specific paradigms for particular tasks, they are using a random-open compromise paradigm. On the other hand, if family members disagree on whether to use an open or a random paradigm to utilize resources, they would find their open and random paradigms in competition for each task, resulting in a random-open compound paradigm.

*Enabled and disabled family paradigms.* Within their configuration of paradigms, families may have differing levels of success in meeting their individual and group goals with their available resources. If most of the family needs and goals are being met, the family operates with an *enabled* paradigm (Constantine, 1986; Imig, 2000a). If the family

is not successful in its resource allocation and goal attainment, the family uses a *disabled* paradigm.

Families under stress may rely increasingly on their paradigms, repeating the same behaviors which have already caused negative functioning (Constantine, 1986, pp. 202-205; Imig, 2000a, Ch. 10, pp. 1-10). For example, closed families might further tighten their boundaries against outside influences and impose dictatorial rule. Random families could be hampered by each individual competing for all of the family's resources and goals. Open families might be paralyzed by unending negotiations and schisms. Synchronous families may expel members who do not understand and follow the family's unstated way of functioning. If this negative functioning persists, the family's functioning is disabled.

A disabled family may benefit from counseling to improve its functioning. The counseling would be undertaken, not to change the family's worldview, but to increase the effectiveness of its current paradigm (Imig, 2000a). In other words, the purpose of counseling is to change a disabled paradigm into an enabled paradigm. For example, counseling a family with a random, disabled paradigm would not require the family to change its paradigm. Instead, counseling would focus on ways to enhance its strategies to accomplish what the family deems important within its random worldview. See Constantine (1986) for family therapy approaches to use with different paradigms.

Four Player Parts within the Family Paradigm. Kantor and Lehr (1975) outlined four possible behaviors within the family system: initiating, opposing, supporting, and observing. These behaviors are represented by the player parts of mover, challenger, follower, and bystander, respectively, which are incorporated within every relationship. In addition, the player part patterns vary by paradigm. In a closed family paradigm, the mover initiates a time-honored strategy that the follower will support (Constantine, 1986; Imig, 2000a; Kantor & Lehr, 1975). The challenger offers constructive criticism to improve the strategy. The bystander acts as the conscience for the mover and requires all family members to conform to the time-honored strategy.

In a random family paradigm, the mover initiates a strategy but does not expect anyone else to follow it (Constantine, 1986; Imig, 2000a; Kantor & Lehr, 1975). The challenger will support the mover's right to initiate a strategy as long as the strategy does not impinge upon other family members' resources. The follower will choose to support the mover or the challenger and does not automatically follow the mover's strategy. The bystander ensures healthy competition for the resources and goal priorities among the mover, the challenger, and the follower.

In an open family paradigm, the mover proposes a possible action while the challenger offers suggestions to improve the proposed action (Constantine, 1986; Imig, 2000a; Kantor & Lehr, 1975). The follower supports this dialogue. The bystander is important to encourage consensus-building to create the actual strategy that will be used by the entire group.

In a synchronous family paradigm, the mover begins an activity that naturally flows from the environment and context (Constantine, 1986; Imig, 2000a; Kantor & Lehr, 1975). No follower or challenger is needed because everyone already knows what to do. Everyone is a bystander because each knows that this activity is required by the context of daily life.
## AAC and Family Paradigms

AAC researchers and clinicians increasingly have focused on the concerns and views of the AAC user and his or her family (Angelo, 2000; Angelo et al., 1995; Angelo, Kokoska, & Jones, 1996; Blackstone, Williams, & Joyce, 2002; Cress, 2004; Jinks & Sinteff, 1994; Jones, Angelo, & Kokoska, 1998; Schlosser, 1999; Sweeney, 1999; VanBiervliet & Parette, 1999). Parette and Angelo (1998) summarized some of the research on how assistive technology; including AAC systems of sign language, communication pictures, communication books, and voice output communication aids (VOCAs); may affect the family of young children with disabilities. For example, at least one caregiver will likely need to use time and energy to implement, learn, and/or troubleshoot the AAC system. The researchers suggested that professionals should ask the family how physical and interpersonal space within the home as well as material resources are likely to be affected by the addition of different AAC components. The environments of home, school, and other community locations must accommodate the differing physical space needs (e.g., weight, size, and shape) of the selected AAC system. In addition, many families want additional information about different types of AAC and how they work in other families' homes. The researchers also noted that families may not have realistic expectations of how AAC will affect their daily lives. Professionals must also try to understand how the family's values affect its perception of different AAC components.

While this research (Parette & Angelo, 1998) cites family systems theory, it does not use family paradigms as its theoretical framework. Through the organizing framework of family paradigms, these AAC issues could be viewed in the context of how the family uses the resources of time, space, energy, and materials to achieve its goals of control, affect, meaning, and content.

Families will have to decide how much time and energy they should devote to AAC issues. AAC use may have a negative effect on the regulation of interpersonal space (e.g., family cohesion) if it results in fewer resources being available for other family members' needs. Material issues related to the AAC system might include the role of technology within the family structure and whether possessions are individually or communally used. This may lead to decisions on where and how AAC may be used in the family. For example, some families will post communication pictures throughout the house, while other families will reject this as inappropriate home decorating. Likewise, in some families, the AAC system will be viewed as something that only the AAC user should touch while, in other families, the AAC system will be used by multiple family members.

In addition, AAC may alter families' views of accomplishment or control, of affect or love, of value or meaning, and of reality or content by changing the roles and the expectations of family members. Complicated AAC systems may challenge the family's feeling of control. Affect for each other may be strained by changing demands on the family's resources. Professionals may not understand the family's dreams or values. The person without AAC may have been viewed as a non-communicator, which was part of the family's reality or content. After successful AAC implementation, the family's content goal must change, as the AAC user becomes a better communicator of his or her thoughts.

Any changes in the family's use of resources and goals will likely lead to increased stress in the family system. Professionals need to recognize the increased family stress and help families find the least stressful ways to integrate AAC into their lives (Parette & Angelo, 1998).

Current AAC practices often rely on integrated and predictable communication opportunities (Beukelman & Mirenda, 1998; Calculator & Jorgensen, 1991; Goosens', Crain, & Elder, 1992; Zangari & Kangas, 1997). As a result, these practices appear to favor open and closed family paradigms. Since open families value communication from all members, they may be eager to expend family resources to ensure a more elaborate voice from the AAC user. Closed families rely on routines that may allow for predictable communication opportunities for beginning communicators, although closed families may not be comfortable with the nontraditional mode of communication. They may prefer to wait longer before implementing AAC to see if their child will develop speech, which many would consider a more traditional mode of communication.

Matching AAC systems to random and synchronous family paradigms appears more difficult than open and closed views when considering current AAC service delivery models. Random families value spontaneous communication, which is difficult to accomplish with AAC systems that need to be created or programmed before communication opportunities arise. Different members of random families may value different communication methods, thus creating a multimodal AAC system. Synchronous family members do not need overt communication to expend its resources or to accomplish its goals. Therefore, they may deem AAC unnecessary to successful synchronous functioning.

AAC recommendations may be most successful in a closed family paradigm when AAC systems require limited change in the daily routines and recognize the hierarchical communication pattern. For example, if the person currently communicates by eye gazing at desired objects, perhaps the initial AAC system would include eye gazing at picture symbols in order to choose desired activities and objects. With the closed family's use of routines, predictable choices are known and could be placed on communication boards. However, closed families may not be comfortable with nontraditional modes of communication and wait longer before implementing AAC in the hope that their child will develop speech.

In contrast, the random family may fluctuate in the amount of resources expended for AAC integration. This may be negatively perceived by professionals as inconsistency and a lack of follow-through by the family. Each family member may have developed a different way of communicating with the AAC user. Thus, the AAC system may be truly multimodal in this family paradigm. For example, the AAC user may vocalize with the mother, use a communication board with the father, and use a voice output system in the community. One difficulty with AAC systems operating within a random paradigm is ensuring spontaneous communication messages. Simple digitized speech devices that allow for quick recording of messages may be useful in such circumstances. On a positive note, random families may be more interested in trying innovative AAC systems.

An open family paradigm requires all family members to achieve consensus on a practical, flexible plan. AAC that provides the greatest communication opportunities may be most valued. Family members will work together to implement and integrate AAC because of their desire for the AAC user's full participation in the family. This family type may be more successful than the other paradigms in integrating AAC recommendations within its daily life.

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In contrast, a synchronous family shares an implicit, unstated plan. Explicit communication is not needed for family functioning because everyone "just knows" what to do. The professionals may feel that the family is uncooperative and non-communicative. However, to the family, collaboration with the professional team may not be seen as necessary to the successful function of the family. Synchronous communication may already be reported between the major caretaker and the potential AAC user so the intervention goals might be better focused on communication outside of the synchronous family system or subsystem. The family members may be willing to facilitate the AAC user's communication with peers, teachers, and other community members rather than within the family.

Family paradigm theory provides a theoretical framework including potential variables from which to research AAC intervention. While professionals recognize the family's critical role in an AAC user's communicative success (Huer & Lloyd, 1990), professionals have difficulty predicting the family's responses to AAC. According to family paradigm theory, each family decides, based on its paradigm, which resources and goals to use towards changing the person's lack of intelligible communication. AAC professionals may not have questioned their own assumptions about "appropriate" paradigms and strategies. AAC professionals and families have not considered explicitly that families' different ways of using their time, energy, space, and materials to achieve control, affect, meaning, and content may influence their decisions regarding AAC.

## Research Questions

This research explored the applicability of family paradigm variables to early AAC intervention by asking parents of young AAC users to complete three instruments: a case

history, an AAC satisfaction rating scale, and a family paradigm scale. The objectives of this study were to

- 1) identify the then current paradigms of the family,
- 2) determine if the family believed that its use of the paradigms had changed from
  - a. the time before the child was diagnosed as having a severe communication problem and
  - b. after the diagnosis but before AAC was obtained, and
- 3) explore satisfaction with the family's paradigm and the AAC system.

#### CHAPTER 2

## **Research Design and Methods**

## **Participants**

Fifty-four primary caregivers of young AAC users participated in this study. Primary caregivers self-identified themselves as the adults in the families who spent the most time communicating with the AAC user and/or who had more child care and home responsibilities.

The young AAC users were toddlers and preschoolers (i.e., had not begun kindergarten) with severe communication disorders. Severe communication disorders occur when "gestural, speech, and/or written communication is temporarily or permanently inadequate to meet...communication needs" (American Speech-Language-Hearing Association, 1991, p. 10). Some of the AAC users in this study used vocalizations, gestures, speech, and/or speech approximations at least some of the time. None of the AAC users in this study had hearing loss as the primary cause of their communication disorder.

The AAC children in this study, ages one to six, had used their current AAC system between 6 months and 2 years. This time period was selected for two reasons: 1) to allow time for families to adjust to the AAC system and 2) because assistive technology abandonment is believed to be greatest within the first three months of obtaining new technology (Scherer, 1996, p.115). However, no level of family adjustment was presumed, and caregivers were asked in the case history about use frequency of different AAC system components at home. See Appendix B for questions 20 to 24 in the case history.

#### Instruments

*Case History Questionnaire.* The case history contained 81 questions, which are listed in Appendix B. The AAC user section contained 45 questions about the child's birth date, gender, race, ethnicity, disability, acquisition and use of multimodal AAC components, communication skills, and educational setting. The family section contained eight questions regarding the language(s) spoken at home, number of siblings, geographical location, and income. The primary caregiver and secondary caregiver sections contained 28 questions that asked for caregivers' ages, gender, relationship to the AAC user, marital status, education, employment status, occupation, race, and ethnicity. The wording of the questions was refined with input from two mothers of AAC users and ten professionals in education or communication disorders.

AAC Family-Paradigm Assessment Scale. The AAC Family-Paradigm Assessment Scale (AACF-PAS) was specifically developed for this study and can be found in Appendix C. The AACF-PAS was adapted from the R-PAS, the Relational-PAS, (Imig, 2000b), which determines the paradigm orientation and player part for each of the resource and goal elements. (Note: The player part data was not analyzed for this research.) The AACF-PAS retained the order of the 20 questions from the R-PAS, and the wording was only minimally changed (i.e., "relationship" was replaced by "family"). The statement "Please check that each column has one and only one 10 in it" was added to the last page of the paper version after several participants had difficulty completing the AACF-PAS.

The *R-PAS* required judgments of current and ideal functioning for each item. For the *AACF-PAS*, participants also provided two retrospective judgments of family functioning: before the child was diagnosed with a severe communication problem and after the diagnosis but before AAC was implemented. They also indicated how they would prefer their families to function if they lived in an ideal world. Thus, four judgments of family paradigms were computed from the *AACF-PAS*:

- The paradigm before the child was diagnosed with a severe communication problem, as perceived retrospectively (Before-Diagnosis paradigm);
- The paradigm after the diagnosis but before AAC was implemented, as perceived retrospectively (After-Diagnosis paradigm);
- The paradigm existing with the then current AAC system (Post-AAC paradigm); and
- The paradigm desired, hypothetically, in an ideal world (Ideal paradigm).

While the retrospective judgments were a new application of the *PAS*, they offered the potential for comparing the current and desired paradigmatic orientation to the person's perceived past orientation. This comparison could provide useful insights into how the family viewed its behavioral changes over time. In the *AACF-PAS*, caregivers self-identified these two retrospective points when they were asked to think back to those times. Some early intervention research suggests that parents are able to identify stressful events (Bailey, 1988). These events likely include the diagnosis of a disorder and transitions of services. Consequently, parents are likely to view the diagnosis of a severe communication disorder as a stressful event and the AAC recommendations as both a change in the child's communication mode and as a loss of typically-developing speech and language. In



addition, families may rely more on their paradigms during periods of stress (Imig, 2000a) so that family functioning may be clearly remembered from those times.

The original works of Kantor and Lehr (1975) and Constantine (1986) were based on a qualitative methodology of extensive field observations for each family. This extensive observation of families within their multiple environments does not translate easily to clinical use. To rectify this difficulty, the PAS (Imig, 1993; Imig & Phillips, 1992) was created as a paper-and-pencil instrument to use in intervention counseling. The item construction for the original PAS was based on Kantor's, Lehr's, and Constantine's qualitative research. During research to develop the Family Regime Assessment Scale (FRAS), an earlier version of the PAS, participants who identified with different paradigms commented on both the appropriateness and the acceptability of the wording of the PAS (Imig & Phillips, 1992). The scoring of the PAS required a scaling procedure, based on MultiAttribute Utility Technology (MAUT), where respondents assigned numerals 0 to 10 to each statement (Edwards & Newman, 1982). A 0 represented the perceptual judgment that this attribute was not characteristic of how the family functioned, while a 10 indicated that this attribute was exactly how the family functioned. The MAUT procedure transformed these raw scores into complex coefficients, which were list-ordered from the family's highest to the lowest attributes. These results were then compiled into quartile and cluster scores (Imig, 2000a). Details about these calculations can be found in Appendix D.

All versions of the PAS appear to have construct validity, since they were specifically created to measure the structures and player parts described in family paradigm theory (Constantine, 1993a; Imig, 1993, 2000a; Imig & Phillips, 1992). Family experts and participants have felt that the FRAS and the R-PAS are representative of family functioning,



which is a component of content validity (Imig, 1993, 2000a; Imig et al., 1996; Imig & Phillips, 1992; Pate, 1994; Pegorraro, 1999). The *FRAS* is recognized as a measure within the discipline of family science (Touliatos, Perlmutter, & Straus, 1999, pp. 50-51). Criterion-related validity has not been established due to the fact that the *PAS* is the only instrument currently available for measuring family paradigms. However, professionals and family members have found the results useful in research and clinical activities (Imig, 1993, 2000a; Imig et al., 1996; Imig & Phillips, 1992; Pate, 1994; Pegorraro, 1999; Villarruel et al., 1995; Ward, 1997). Different versions of the *PAS* have been used to assess paradigm orientation in several research studies, such as post-divorce adjustment of divorced single-mother families (Pate, 1994); individuals', couples', and families' behavior under stress (Imig, 1993; 2000); families' decisions to home-school their children (Pegorraro, 1999); factors affecting participation in men's groups (Imig et al., 1996); and factors affecting transfer of family businesses within the family (Imig et al., 1996). Test-retest reliability studies are still needed for the *PAS*.

Variables. The independent variables were based on the child's age, the severity of the child's disability, the amount of AAC use at home, and the overall paradigm cluster score for each paradigm. The dependent variables included the overall paradigm difference score and the primary caregiver's satisfaction with the child's AAC system.

The child's age in months was calculated as the difference between the birth date and the case history date completion for the Internet version or between the birth date and the date the paper version was returned. The severity of the disability variable was ordinally-based on the parent's severity rating of the effect of the child's physical and/or cognitive disability on the family's daily activities:

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1 = mild,

2 =moderate, and

3 =severe.

(See Appendix B for questions 7 in the case history.)

The ordinal AAC-use variable was based on the AAC components that were used "often" or "always" at home:

0 = no AAC components used,

1 = unaided AAC components,

2 = no technology AAC,

3 =low technology AAC,

4 = direct select computer-based,

5 = non-direct select computer-based,

6 = multimodal combinations.

This new variable was created from the answers of case history questions 15 through 25.

(See Appendix B for question wording.)

The family ordinal variable represented the family's resource of income by income category. (See Appendix B for Question 53 in the case history.) Originally, the number of adults in the household was also going to be used in the creation of the family ordinal variable. (See Appendix B for Question 50 in the case history.) However, 50 of the 54 families had only two adults living in the house so that variable was not included in the family ordinal variable due to the data set's limited variability.

Family paradigm was operationalized as a rating of 5 on the AACF-PAS overall cluster score for categorical descriptives. Within the multiple regression analysis, each

family paradigm was captured as an ordinal variable from a 0, meaning the family never used those paradigm strategies, to a 5, meaning that the family always or almost always used those paradigm strategies.

The dependent variable of paradigm change was calculated as the structural difference score for the overall cluster score between two judgments. First, the absolute value of each paradigm difference score was calculated. For example, the formula to calculate the closed paradigm difference score from the Before-Diagnosis judgment to the After-Diagnosis judgment was:

Closed paradigm difference score = | Closed paradigm cluster score from

Before-Diagnosis - Closed paradigm cluster score from After-Diagnosis |

This calculation was repeated three times, replacing closed with random, then with open, and finally with synchronous paradigm cluster scores. In order to calculate the overall paradigm difference score, the closed, random, open, and synchronous paradigm difference scores were totalled.

The dependent variable of AAC satisfaction was created from the primary caregiver's rating from question 12 or 14 in the case history:

- 1 =strongly dissatisfied,
- 2 = dissatisfied,
- 3 = neutral,
- 4 =satisfied,
- 5 = strongly dissatisfied.

(See Appendix B for question wording.) Satisfaction ratings from question 14 were used except for those caregivers who responded that the child was still using the first AAC



system. In those cases, the satisfaction rating from question 12 regarding the first AAC system was used.

#### Procedures

Few demographics have been collected on young AAC users. In the United States, children with severe disabilities have been estimated as comprising 0.4% of the under 3year age group, with males (0.5%) numbering more than females (0.1%), and 0.7% of the 3- to 5-year age group, with males (0.9%) numbering more than females (0.4%) (Aron, Loprest, & Steuerle, 1996, p. 19). Children with severe communication disorders are likely some part of this category; however, the exact number of AAC users is not known for these age groups. No large pool of young AAC users and their families was found during this study. This made random sampling from the population of families with young AAC users problematic. Therefore, a convenience sample was used for this initial study.

The families were recruited nationally through networks of AAC professionals, parent support groups, disability rights organizations, and AAC consumer groups. More than 500 advertising contacts were made by e-mail, phone calls, mail, and face-to-face appeals over a 14-month interval. Where appropriate, advertising contacts were repeated every three to four months. Announcements about the study were posted on websites and emailed on listservs; some readers forwarded the postings to other professionals and family members. Advertisements reached people throughout the United States. Interested people e-mailed or phoned the researcher who determined project eligibility, explained the participant tasks, and answered any questions via phone or e-mail.

Caregivers were advised of their rights through a written consent form approved by the Michigan State University Institutional Review Board and were paid \$15 for participation. The primary caregiver completed the case history questionnaire, the *AACF*-*PAS*, and the AAC in Families survey. (Note: The results from the AAC in Families survey will be analyzed at a later date.) Estimated completion time for all three questionnaires was 60 to 90 minutes. The caregiver had the choice of either completing the paper version and sending it through the mail or completing the electronic version through a secure Internet site. If the caregiver completed the paper version, the researcher copied the caregiver's answers onto the electronic version. Caregivers were asked to complete the questionnaires within two weeks. If questionnaires were not completed and returned after three weeks, the researcher used e-mails and/or phone calls to determine any problems and to encourage the participant to complete the questionnaires.

Fifty-four primary caregivers participated in this project. Nineteen (35%) respondents completed the paper version and 35 (65%) of the respondents completed the electronic version. (Note: One of the respondents switched to paper after having difficulty accessing the electronic version.) On average, the families using the electronic version had higher incomes and lived in more densely populated areas than the families using the paper version. Fourteen additional primary caregivers enrolled in the study but did not complete any of the instruments: nine gave no reason, three reported time constraints, and two were caring for new babies.

Forty-two primary caregivers completed all three instruments. In addition, 12 caregivers completed the case history but did not complete the *AACF-PAS*. Reasons given for the incomplete *AACF-PAS* included difficulty understanding the instructions, intricacy of the rating task, and encountering time constraints. In addition, eight primary caregivers did not correctly complete the paper version of the *AACF-PAS*. Seven of the eight *AACF*-

*PAS* were used after rules for incomplete or incorrect data were applied. (See Appendix E for the rules used.)

Results were imported into a Microsoft Access database. Multiple response questions were recoded into binary categories. Data entry was checked for accuracy. In addition, the caregivers' responses were checked for errors and inconsistencies, which were corrected when possible. For example, Question 49 of the case history asked for the number of children in the family, including the AAC user, who had disabilities. Responses of 0 were changed to 1 as all of the families had at least one child using AAC.

### Analysis

Data analysis was completed using the statistical software package of SPSS 12.0 for Window. An a priori decision of  $\alpha = .05$ , with two-tailed tests as applicable, was used for all statistical tests. The main purpose of this initial study was to describe possible relationships among family, child, and AAC variables. These relationships will need to be replicated in future research. Therefore, an experimental alpha was not adjusted for the multiple statistical tests in this exploratory study.

Research Question 1. Identify the paradigmatic orientations of AAC families after AAC was obtained for their young children. A frequency distribution of paradigms for the Post-AAC judgment was compiled and compared to the AAC user, family, and caregiver demographics using Spearman rank correlational analysis.

Research Question 2. Determine if changes in the family's paradigm occurred when (a) parents became aware of the child's severe communication disorder and (b) AAC was obtained. For part a, the Before-Diagnosis judgment was compared to the After-Diagnosis judgment, and, for part b, the After-Diagnosis judgment was compared to the Post-AAC judgment. According to Imig (2000a), a cluster structure that showed a difference value of 2 or larger for a paradigm is noteworthy. For example, a cluster score of 5 results from a caregiver's judgment that a particular strategy is used always or almost always, which is indicated by ratings of 9 or 10 on the *AACF-PAS*. A cluster score of 3 results from a caregiver's judgment that a particular strategy is used sometimes which is indicated by ratings of 6 or 5 on the *AACF-PAS*. Thus, a cluster score change from 5 to 3 indicates that the caregiver had noted that the paradigm strategy decreased from being used always or almost always to being used sometimes.

Multiple regression was used to compare the paradigm difference score with the original family paradigm while statistically controlling for children, the AAC system, and family variables. The additive multiple regression model was:

change in family paradigm (total cluster score difference) = intercept + $\beta_1$ closed cluster +  $\beta_2$ random cluster +  $\beta_3$ open cluster +  $\beta_4$ synchronous cluster +  $\beta_5$ severity of child's disability +  $\beta_6AAC$  ordinal variable +  $\beta_7$ family resources.

Research Question 3. Determine satisfaction with family paradigm and the current AAC system used at home. Comparing the Post-AAC judgments and the Ideal paradigm judgments from the AACF-PAS provided data regarding whether the primary caregiver was happy with the current paradigm orientation. If the difference score between the paradigms showed a difference value of 2 or greater (Imig, 2000a, Ch. 11), then the caregiver desired some changes in his or her current paradigm use.

Multiple regression was used to compare the difference scores and the primary caregivers' satisfaction with the family paradigms while statistically controlling for some of the child, the AAC system, and family variables. The first additive multiple regression model, using the Post-AAC paradigm cluster scores to predict the difference between the judgments and Ideal paradigm judgments, was:

change in family paradigm (total cluster score difference) = intercept + $\beta_1$ closed cluster +  $\beta_2$ random cluster +  $\beta_3$ open cluster +  $\beta_4$ synchronous cluster +  $\beta_5$ severity of child's disability +  $\beta_6$ AAC ordinal variable +  $\beta_7$ family resources.

In addition, caregivers' satisfaction with the AAC system being used can be compared to the paradigm judgments. Multiple regression was used to compare the caregivers' satisfaction with the family paradigm while statistically controlling for some of the child, the AAC system, and family variables. The second additive multiple regression model was:

primary caregiver satisfaction with AAC system = intercept + $\beta_1$ closed cluster +  $\beta_2$ random cluster +  $\beta_3$ open cluster +  $\beta_4$ synchronous cluster +  $\beta_5$ severity of child's disability +  $\beta_6$ AAC ordinal variable +  $\beta_7$ family resources.

A priori Power Analysis for Research Questions 2 and 3. The exploratory nature of this project required adopting a medium effect size of r = .36 and  $R^2 = .13$  (Cohen, 1988) as is a typical convention of social sciences research. A sample size of 37 (Hintz, 2001) achieved 70% power (Stevens, 1999) to detect a medium effect of family paradigm

variables using an F-test ( $\alpha = .05$ ). Tested variables were adjusted for an additional three independent variables with medium effects ( $R^2 = .40$ ).

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### CHAPTER 3

Results

The results are presented in four sections: 1) demographics, 2) Post-AAC paradigms, 3) changes in paradigms After-Diagnosis and Post-AAC, and 4) paradigm and AAC satisfaction.

## **Demographics**

Fifty-four U.S. families with 55 AAC youngsters participated. One family had twin AAC users. Families lived in 27 different states with only Arizona (n = 7) and Minnesota (n = 6) contributing more than 10% of the sample. The demographics were also computed for the subset of 42 families with 43 AAC users who completed the *AACF-PAS*. Tables 3 through 14 contain demographics for the full sample of 54 families and for the subset of 42 families.

Independent t tests were run between the demographics for the 42 families with AACF-PAS data and the 12 families without AACF-PAS data. Only the variable of "satisfaction with the first AAC system" was statistically different, t(52) = 5.0, p < .0005. Those who did not complete the AACF-PAS were more satisfied with their first AAC system (M = 4.5) than those who did complete the AACF-PAS (M = 3.4). (See Table 11 for details on the satisfaction ratings.)

As seen in Table 3, the age of the child ranged from 15 months to 75 months with an average age of 47 months. Sixty-five percent of the children were boys and 35% were girls. All of the children were identified as Caucasian. A few children also were identified as American Indian or Alaskan native; Asian, Native Hawaiian or other Pacific Islander; or H ÿ a ¢ Ņ **r** V Ţ ť 0 Hispanic or Latino. The primary caregivers were all female, with an average age of 36 years and ages ranging from 23 to 53 years. The secondary caregivers were all male, with an average age of 38 years and ages ranging from 26 to 58 years. Fifty-three of the primary caregivers were Caucasian, one was American Indian or Alaskan native, and one Asian, Native Hawaiian or other Pacific Islander. Fifty-one of the secondary caregivers were reported to be Caucasian; one was reported to be American Indian or Alaskan native; two were was reported to be Asian, Native Hawaiian or other Pacific Islander or the Pacific Islander; and one was reported to be Hispanic. None of the children or caregivers were African American. Non-Hispanic and Caucasian people were over-represented in this sample when compared to the 2003 general population of the U.S: 14% Hispanic; and 82% Caucasian, 13% African American, 5% Asian, 2% American Indian or Alaskan native, and less than 1% Native Hawaiian or other Pacific Islander (U.S. Census Bureau, 2004)

Almost all of the families were two-parent intact families. Fifty-three primary caregivers were married to the child's other parent while only one family reported the caregivers being separated or divorced. Fifty-two of the primary and the secondary caregivers were the biological parents of the AAC user while two sets of the primary and the secondary caregivers were adoptive parents. In contrast, 69% of U.S. children under the age of 18 lived with two parents; 88% of which were two biological parents; 9% were one biological and one stepparent; 1% was adoptive parents; and 1% was other combinations (U.S. Census Bureau, 2001, p. 6-2)

As seen in Table 4, the caregivers were generally well-educated with only 9% of the primary caregivers and 13% of the secondary caregivers having a 12<sup>th</sup> grade education or lower. Indeed, 43% of the primary caregivers and 36% of the secondary caregivers had

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taken or completed graduate level studies. In contrast, females in the U.S., aged 25 to 49 years, listed their educational attainment as 4% junior high or less, 37% high school, 29% some college, 21% college degree, and 8% advanced degree. Similarly, males in the U.S., aged 25 to 49 years, listed their educational attainment as 4% junior high or less, 40% high school, 26% some college, 20% college degree, and 9% advanced degree. [Note: Educational attainment levels for females and males were calculated from a U.S. Census data set (U.S. Census Bureau, 2002).]

Sixty-one percent of the primary caregivers were stay-at-home caregivers, 20% were part-time employees, 19% were full-time employees, 9% were business owners or self-employed, 6% were students, and 2 % were unemployed as listed in Table 4. In contrast, 4% of the secondary caregivers were stay-at-home caregivers, 4% were part-time employees, 76% were full-time employees, 13% were business owners or self-employed, 2% were students, and 0% were unemployed. (Note: Respondents could indicate multiple responses for employment level so employment percentages could exceed 100%.)

Family characteristics are listed in Table 5. The AAC user was the only child in 30% of the families as compared to 21% of U.S. families having only one child (U.S. Census Bureau, 2001, p. 6-2). Thirty-five percent of the AAC families had two children, and 35% had three to five children including the AAC user. Eighty-seven percent of the families had only one child with a disability. English was spoken in all of the homes; in one home Spanish was also spoken. Sixteen percent of families reporting made under \$40,000 annual gross income; 57% made \$40,000 to \$99,999; and 27% made \$100,000 or more per year. Six percent of the 54 families did not report their income. The families in this sample had generally higher income when compared to married-couple families in the general U.S.

population of whom 30% made under \$40,000 annual gross income; 51% made \$40,000 to \$99,999; and 19% made \$100,000 or more per year (U.S. Census Bureau, 2000). Fifteen percent of families lived in rural areas, 22% lived in towns smaller than 50,000 people, and 63% lived in larger metro areas.

Table 6 shows the frequency of different diagnoses, the effect of the child's disability on the family's daily activities, and the child's educational settings. Most of the children had multiple diagnoses. Of the 55 AAC users, 60% had a developmentally-delayed label, 33% had apraxia, 33% had mental retardation, and 29% had autism or pervasive developmental disorder. When the primary caregiver indicated the impact of the child's disability on the family's daily activities, 15% chose mild, 56% chose moderate, and 29% chose severe. The children often had multiple educational settings with 44% receiving home visits, 49% attending self-contained preschools (where all the children had disabilities), and 42% attending inclusive preschools (where at least 50% of the children had no disabilities).

Table 7 lists the ages when the child's problems were suspected and then diagnosed. It also lists the ages when the first and the latest AAC systems were acquired. Nearly half of the children were less than one year old and all of the children were under three when a problem was suspected. Thirty-one percent of the 55 children were diagnosed before their first birthday, 58% before their second birthday, and 89% before their third birthday. Two of the children did not yet have a firm diagnosis. The first AAC system was acquired for 16% of the children before their first birthday, 29% between their first and second birthday, 33% between their second and third birthday, 18% between their third and fourth birthday, and 4% between their fifth and sixth birthday. Twenty-seven percent of the 55 children are still using their first AAC system. In contrast, 7% received their latest AAC system between their first and second birthday, 26% between their second and third birthday, 18% between their third and fourth birthday, 20% between their fourth and fifth birthday, and 2% between their fifth and sixth birthday.

Table 8 lists the amount of time between when the problem was first suspected or diagnosed to when AAC was acquired. On average, one year passed between the first suspicion of the problem to actually receiving the first AAC system, although some families waited as long as 5 years. In a few cases, baby sign, which has been used with typically-developing infants, was implemented before the parents suspected that the child had a problem. That is why the minimum length of time between suspecting a problem and implementing the first AAC system was negative. (See Acredolo, Goodwyn, & Abrams, 2002, for a description of baby sign.) On average, a half year passed between the child's diagnosis and the acquisition of the first AAC system. For those 40 AAC users who were not using their first AAC system, an average of 1.2 years passed with a range from less than a year to 4 years between the first and the latest AAC system.

Sign language, communication pictures or boards, communication books, simple VOCAs, and complex VOCAs were most often available in various combinations. Table 9 lists the frequencies of these multimodal combinations. Eighty-two percent of all 55 children had sign language available with 20% of the children having sign language as their only mode of AAC. Sixty-seven percent of all the children had communication pictures and/or boards available with only one child having only communication pictures and/or boards. Twenty-four percent of the children had communication books available with none of the children having only communication books. Thirty-three percent of the children had simple VOCAs available with none of the children having only simple VOCAs. Thirty-five percent of the children had complex VOCAs available with two of the children having only complex VOCAs. Some of the communication pictures were described as PECS, an acronym for the Picture Exchange Communication System (Frost & Bondy, 2002). Different models and manufacturers were listed for the simple and complex VOCAs.

Table 10 lists the frequency of use of different communication modes in the home environment. Vocalizations were used often or always by 58% of the 55 children; 4% never vocalized at home. Speech or speech approximations were used often or always by 31% of the 55; 22% did not use any speech at home. Pointing or gesturing was used often or always by 56% of the 55 children; 13% did not use pointing or gesturing at home. All of the children who had sign available used it at least part of the time. Sign language was used often or always by 67% of the 45 children reported to have sign language available. Communication pictures or boards were used often or always by 24% of the 37 children reported to have communication pictures or boards which is in contrast to 11% who did not use their communication pictures or boards at home. Communication books were not used often or always by any of the 13 children reported to have communication books. Instead, about half used their books rarely and half used their books sometimes at home. Simple VOCAs were used always by 24% of the 18 children reported to have simple VOCAs available which is in contrast to 29% who did not use their simple VOCAs at home. Complex VOCAs were used always by 42% of the 19 children reported to have complex VOCAs available, which is in contrast to 11% who did not use their complex VOCAs at home. Thus, unaided AAC (i.e., sign language) was used by a higher percentage of children

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than aided AAC (i.e., complex VOCAs, communication pictures or boards, simple VOCAs, and communication books).

Table 11 lists the frequency of the different categories of the ordinal AAC-use variable, which was based on which AAC components were used often or always at home. Twenty-six percent of the 55 children did not use any of the AAC components often or always. Forty-seven percent used unaided AAC components (i.e., sign language) often or always, and 9% used non-voice output aided AAC components (i.e., communication pictures, boards, and/or books) often or always. Four percent used direct select complex VOCAs often or always, and 15% used more than one AAC component (i.e., multimodal) often or always. Satisfaction data with the AAC system are also contained in Table 11. Sixty percent were satisfied with the first AAC system, and 75% were satisfied with their then current AAC system, which included the 15 first AAC systems that had not been changed.

Table 12 outlines the children's language skills with or without using the AAC system. Twenty-two percent of the children responded but did not initiate communication, and 26% did not spontaneously communicate. Thirty-six percent of the children produced more than 50 words independently with or without AAC. Thirty-three percent produced 10 to 50 words, 27% produced 1 to 9 words, and only 4% produced no words independently with or without AAC. (Note: Children could have skills in several categories so the following percentages do not add to 100%.) Forty-six percent of the children followed requests and directions without assistance, and 66% made spontaneous requests. Forty-four percent of the children responded to comments appropriately and directions without assistance, but only 26% made spontaneous comments. Thirty-five percent of the children

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answered questions appropriately, but only 15% asked spontaneous questions. In terms of utterance length, only 18% of the children used three-word or longer utterances, and only 5% of the children constructed grammatically-correct sentences.

Table 13 lists reasons why the 11 unaided children did not have any aided AAC components available at home. The most frequently-selected reason was that the child talked, signed, or gestured (64% of the 11 children). This was followed by the explanation that the family was not given any reason for not using aided AAC (46% of the 11 children).

In Table 14, the subset of aided AAC components is described. Color line drawings, color photographs, printed words, and black and white line drawings were used by more than half of the aided AAC users (n = 44). Forty-one of the 44 aided AAC users were direct selectors; that is they used a finger or another body part to point to or touch the AAC symbol. (See the table for additional selection methods.) More than half of the AAC users had voice-output types of AAC available. Education agencies were the highest sources of AAC funding, followed by the family.

## Post-AAC Paradigms

Forty-two primary caregivers completed the *AACF-PAS*. The criterion for assignment to paradigm categories was an *AACF-PAS* cluster score of 5, which indicated that the family used that particular paradigm often or always. A given family could have a 5 in more than one paradigm, indicating that the family frequently uses multiple paradigms. Fourteen families (33%) used a closed paradigm, 20 families (48%) used a random paradigm, 32 families (76%) used an open paradigm, and 4 families (10%) used a synchronous paradigm. As shown in the Post-AAC column of Table 15, 22 families (53%) indicated using primarily one paradigm: 5 closed, 5 random, and 12 open. Fourteen families (33%) indicated using a combination of 2 paradigms: 3 closed-open, 10 random-open, and 1 open-synchronous. Six families (14%) indicated using a combination of 3 or 4 paradigms. Thus, an open paradigm was the most frequently-used paradigm in the Post-AAC judgment: Twenty-nine percent of the families reported primarily using an open paradigm, 33% of the families reported the combination of open with another paradigm, and 14% of the families reported open within a combination of 3 or 4 paradigms. The most frequent combination, used by 24% of the families, was a random paradigm in conjunction with an open paradigm.

The Post-AAC paradigm was not correlated with the child's age, the child's disability level, the ordinal AAC-use variable, family income, or caregiver education level. Primary and secondary caregivers' ages were significantly correlated ( $\rho = .36$ , p = .028, two-tailed, and  $\rho = .31$ , p = .045, two-tailed, respectively) with an increased reliance on a closed paradigm. In other words, families with older caregivers were more likely to identify a closed paradigm.

# Changes in Paradigms After-Diagnosis and Post-AAC

Forty-two primary caregivers also provided two retrospective judgments of family functioning: before the child was diagnosed with a severe communication problem (Before-Diagnosis) and after the diagnosis but before AAC was implemented (After-Diagnosis). Figure 2 shows how each of the paradigms varied across the 3 judgments of Before-Diagnosis, After-Diagnosis, and Post-AAC. (Note: The Ideal judgment will be discussed in the next section.) Reports of closed paradigm slightly increased from 15
families Before-Diagnosis to 18 families After-Diagnosis but then declined to 14 families Post-AAC. Over half the families (n = 24) perceived their starting paradigm to be random, but only one third of the families (n = 14) used random after the child's diagnosis. However, this decrease was temporary as nearly half the families (n = 20) reported random strategies in their Post-AAC paradigms. The open paradigm (n = 23) was as frequently used as the random paradigm during the time before the child's diagnosis. However, the number of families reporting an open paradigm increased at each successive time point (n = 25 After-Diagnosis, n = 32 Post-AAC). The synchronous paradigm was least used in each of the judgments (n = 3 After-Diagnosis, n = 4 Post-AAC).

Table 15 shows the frequencies of families using different combinations of paradigms across the four judgments. Families showed the most diversity in the Before-Diagnosis judgment, reporting 11 different paradigm configurations (closed, random, open, synchronous, closed-random, closed-open, closed-synchronous, random-open, open-synchronous, closed-random-open, closed-random-synchronous). Random, open, and random-open paradigms were reported by over half the families (n = 24). In the After-Diagnosis judgment, families reported only eight paradigm configurations with a decrease in random paradigms and an increase in closed paradigms (closed, random, open, synchronous, closed-open, random-open, closed-random-open, closed-open-synchronous). The increase in closed paradigms consisted of the following: The purely closed paradigm was reported by three families in the Before-Diagnosis judgment and increased to nine families in the After-Diagnosis judgment; the number of families reporting the closed-open paradigm combination rose from two families in the Before-Diagnosis judgment to seven families in the After-Diagnosis judgment. In the Post-AAC judgments, nine paradigm

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configurations were reported (closed, random, open, closed-open, random-open, opensynchronous, closed-random-open, closed-open-synchronous, closed-random- opensynchronous). From those nine configurations, open and random-open paradigms were most used (n = 22). (The Ideal column will be discussed in the next section on paradigm satisfaction.)

Even though the data above describe overall group changes, changes for individual families can be tracked as a paradigm difference score between cluster scores of two judgments. For example, the closed paradigm difference score between the Before-Diagnosis judgment and the After-Diagnosis judgment was computed as the absolute value of the difference of the After-Diagnosis closed paradigm cluster score subtracted from the Before-Diagnosis closed paradigm cluster score:

closed paradigm difference score = | closed paradigm cluster score from Before-Diagnosis - closed paradigm cluster score from After-Diagnosis | As discussed in the previous chapter, difference scores of 2 or more are considered noteworthy (Imig, 2000a).

Each family had four paradigm difference scores (i.e., one for each paradigm of closed, random, open, and synchronous) per judgment category (i.e., Before-Diagnosis, After-Diagnosis, Post-AAC, and Ideal). Thus, for this set of 42 families, a total of 168 difference scores (i.e., 4 difference scores multiplied by 42 families) existed per judgment category. Most of the cluster score differences were 0, representing no change; or 1, representing a slight change. Comparing the Before- and the After-Diagnosis judgments, 17 families reported only 26 difference scores of 2 or greater. Five were increased closed strategies, six were decreased random strategies, five were decreased synchronous

st A sij m th fa an strategies, and the remaining difference scores did not group into a pattern. Comparing the After-Diagnosis judgments and the Post-AAC judgments, 15 families showed only 18 significant difference scores with no clear paradigm patterns among the families.

In order to determine if certain paradigms were more likely to change, simultaneous multiple regression (Licht, 1995) was used to compare the paradigm difference score with the original family paradigm while statistically controlling for child, AAC system, and family income. The total cluster score difference was the sum of the closed, random, open, and synchronous paradigm difference scores. The a priori hypothetical model was:

change in family paradigm (total cluster score difference) = intercept + $\beta_1$ closed cluster +  $\beta_2$ random cluster +  $\beta_3$ open cluster +  $\beta_4$ synchronous cluster +  $\beta_5$ severity of child's disability +  $\beta_6$ AAC ordinal variable +

 $\beta_7$  family resources.

This model was the starting point for the following two analyses: 1) changes in paradigms from Before- to After-Diagnosis and 2) changes in paradigms from After-Diagnosis to Post-AAC.

Changes in paradigms from Before- to After-Diagnosis. First, the a priori model was evaluated. Seven predictors were used: one for each paradigm and one for each of three possibly-confounding variables: child's disability, AAC use, and family income. The Before-Diagnosis paradigm cluster scores explained nearly one-third of the variance in the difference scores,  $R^2 = .34$ . The overall model was statistically significant, F(7, 31) = 2.30, p = .05. (See the a priori model column of Table 16 for the regression estimates of this model.) As indicated by their nonsignificant regression coefficients, the potentially-

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confounding child, AAC, and family income variables did not contribute to explaining the differences in cluster scores. Therefore, these variables were not used in the subsequent multiple regression modeling for this analysis.

Next, a main effects model was evaluated with the predictors of Before-Diagnosis closed, random, open, and synchronous paradigms. The Before-Diagnosis paradigm cluster scores explained nearly one-third of the variance in the difference scores,  $R^2 = .28$ , and this overall model was statistically significant, F(4, 37) = 3.57, p = .015. (See the main effects column of Table 16 for the regression estimates of this model.) As indicated by their negative significant regression coefficients, the Before-Diagnosis cluster score of random and open paradigms independently decreased .76 and .93, respectively, for every 1 point increase in the difference score, after partialling out the effect of the other variables.

Since the random and open variables were significant in the main effects model, an interaction term of random by open was added to the third model to determine if the interaction was needed to explain the changes in difference scores. The interaction variable did not improve the model as indicated by no change in the proportion of variance explained,  $R^2 = .28$ . This overall model was also statistically significant, F(3, 38) = 4.96, p = .005. (See the interaction column of Table 16 for the regression estimates, none of which were significant predictors of the cluster score change.) Multicollinearity (i.e., highly-correlated predictors) was indicated by the combination of a significant overall model paired with non-significant regression coefficients that had large standard errors. Therefore, this interaction model was rejected due to multicollinearity.

The final and most parsimonious model included only the Before-Diagnosis cluster scores for random and open paradigms and explained 26% of the variance in the difference

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score from before to after the diagnosis,  $R^2 = .26$ . The overall model was statistically significant, F(2, 39) = 6.67, p = .003. (See the final column of Table 16 for the regression estimates.) Although the residuals were somewhat skewed, the model generally appeared to meet the required error assumptions. The fitted model was:

change in family paradigm (total cluster score difference from Before- to After-Diagnosis) = 10.21 - .73random cluster from the Before-Diagnosis judgment - .93open cluster from the Before-Diagnosis judgment.

Thus, this final model shows that the Before-Diagnosis cluster score for random and open paradigms independently decreased .73 and .93, respectively, for every 1 point increase in the difference score while controlling the other variables' effect.

*Changes in paradigms from After-Diagnosis to Post-AAC.* First, the a priori model mentioned at the beginning of this section was evaluated. Seven predictors were used: one for each paradigm and one for each of three possibly-confounding variables, which were severity of child's disability, AAC use, and family income. After-diagnosis paradigm cluster scores explained 31% of the variance in the difference scores. However, the overall model was not statistically significant, F(7, 31) = 2.02, p = .08. (See the a priori model column of Table 17 for the regression estimates of this model.) As indicated by their nonsignificant regression coefficients, the potentially-confounding child, AAC, and income variables did not contribute to the difference in cluster scores. Therefore, these variables were not used in the subsequent multiple regression modeling for this analysis.

Next, a main effects model was evaluated with the predictors of After-Diagnosis closed, random, open, and synchronous paradigms. The After-Diagnosis paradigm cluster scores explained one-fourth of the variance in the difference scores,  $R^2 = .24$ , and this

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overall model was statistically significant, F(4, 37) = 2.89, p = .04. (See the main effects column of Table 17 for the regression estimates of this model.) As indicated by its significant negative regression coefficients, the After-Diagnosis cluster scores for the open paradigm decreased .73 points for every 1 point increase in the difference scored from the After-Diagnosis judgment to the Post-AAC judgment after partialling out the other variables.

The final and most parsimonious model included only the After-Diagnosis cluster scores for the open paradigm and explained only 14% of the variance in the difference score from after the diagnosis to Post-AAC,  $R^2 = .14$ . The overall model was statistically significant, F(1, 40) = 6.41, p = .015. (See the final column of Table 17 for the regression estimates.) Although the residuals were somewhat skewed, the model generally appeared to meet the required error assumptions. The fitted model was:

# change in family paradigm (total cluster score difference from After-

Diagnosis to Post-AAC) = 5.75 - .79open cluster from After-Diagnosis Therefore, this final model showed that the After-Diagnosis cluster score of open paradigms independently decreased .79 for every 1 point increase in the difference score. Paradigm and AAC satisfaction

*Ideal paradigms*. Families were asked to rate the hypothetical paradigm strategies that they would prefer to use in an ideal world. Based on their responses, families could indicate 1, 2, 3, or all 4 paradigms as their ideal. Identification of an ideal paradigm was determined by a given family having a cluster score of 5 for a particular paradigm. The results were that five families (12%) chose a closed paradigm, 25 families (60%) chose a

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random paradigm, 37 families (88%) chose an open paradigm, and 2 families (5%) chose a synchronous paradigm.

As shown in the Ideal column of Table 15, twenty of the 42 families (48%) had a cluster score of 5 for one paradigm: five random and 15 open. Eighteen families (43%) had cluster scores of 5 for two paradigms: two closed-open and 16 random-open. Four families (9%) had cluster scores of 5 for three or four paradigms. An open paradigm was most frequent with 88% of the 42 families having a cluster score of 5 for that paradigm. This 88% subdivided into the following categories: 36% were only an open paradigm, 43% were a combination of open with another paradigm, and 9% were an open paradigm within a combination of three or four paradigms. The next most frequent paradigm was random with 60% of the families: 12% selected a random paradigm, 38% selected a combination of random with another paradigm, and 9% selected a random paradigm within a combination of three or four paradigm. The most frequent combination, selected by 16 of the 42 families, was a random paradigm in conjunction with an open paradigm.

Figure 2 shows how each of the paradigms varied across the four judgments of Be fore-Diagnosis, After-Diagnosis, Post-AAC, and Ideal. The Ideal data is indicated by the hatched bars in Figure 2. (Note: The Before-Diagnosis, After-Diagnosis, and Post-AAC judgments were presented in the previous section.) Reports of closed paradigm decreased to only five families in the Ideal judgment. Over half of the families (n = 25) preferred a random paradigm, rebounding to the pre-diagnosis level. The open paradigm continued to increased at each successive time judgment to a high of 88% (n = 37). In contrast, the synchronous paradigm decreased to 5% (n = 2).

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Table 15 shows the frequencies of families reporting different combinations of paradigms across the four judgments. Families showed the least diversity in the Ideal judgment, reporting only seven different paradigm configurations (random, open, closed-open, random-open, closed-random-open, random-open-synchronous, and closed-random-open-synchronous). Nearly all of the 42 families (n = 36) cited a preference for random, open, or random-open paradigms in the Ideal judgment, as indicated by a cluster score of 5.

As discussed in the previous section, changes for individual families can be tracked as a paradigm difference score between cluster scores of two judgments. Each of the 42 families had four paradigm difference scores per judgment category, resulting in a total of 168 difference scores per category comparison for this set of 42 families. Difference scores between the Post-AAC and Ideal judgments should be zero, if families are satisfied with their family functioning; difference scores of 2 or more suggest that these families want a major change in their current paradigm(s) (Imig, 2000a). Families showed few difference scores of 2 or more between the Post-AAC and Ideal judgments. Most of the cluster score differences were 0, representing no desired change, or 1, representing a slight desired adjustment (Imig, 2000a). Only 9 of the 42 families reported difference scores of 2 or greater between the Post-AAC and Ideal judgments. Those nine families showed 15 changes involving difference scores of 2 or more: 4 decreased closed strategies, 2 increased closed strategies, 3 increased random strategies, 2 increased closed strategies, and 4 decreased synchronous strategies.

Changes in paradigms from Post-AAC to Ideal. In order to determine if certain paradigms were more likely to predict changes in difference scores, simultaneous multiple regression (Licht, 1995) was used to compare the paradigm difference score with the PostAAC family paradigm cluster score while statistically controlling for child, AAC system, and income variables. The total cluster score difference is the sum of the closed, random, open, and synchronous paradigm difference scores from the Post-AAC judgments to the Ideal judgments

The following a priori hypothetical model was the starting point for this analysis: change in family paradigm (total cluster score difference) = intercept  $+\beta_1$ closed cluster +  $\beta_2$ random cluster +  $\beta_3$ open cluster +  $\beta_4$ synchronous cluster +  $\beta_5$ severity of child's disability +  $\beta_6$ AAC ordinal variable +

 $\beta_7$  family resources.

Seven predictors were used: one for each paradigm and one for each of three possiblyconfounding variables: child's disability, AAC use, and family income. Post-AAC paradigm cluster scores explained more than one-half of the variance in the difference scores,  $R^2 = .57$ . The overall model was statistically significant F(7, 31) = 5.82, p < .0005. (See the a priori model column of Table 18 for the regression estimates of this model.) As indicated by their nonsignificant regression coefficients, the potentially-confounding child, AAC, and income variables did not contribute to explaining the difference in cluster scores. Therefore, these variables were not used in the subsequent multiple regression modeling for this analysis.

Next, a main effects model was evaluated with the predictors of Post-AAC closed, random, open, and synchronous paradigms. Post-AAC cluster scores explained one-half of the variance in the difference scores,  $R^2 = .50$ , and this overall model was statistically significant, F(4, 37) = 9.37, p < .0005. (See the main effects column of Table 18 for the

regression estimates of this model.) As indicated by their significant negative regression coefficients, the Post-AAC cluster scores for the open paradigm independently decreased 1.81 and the Post-AAC cluster scores of synchronous paradigms independently increased .52 for every 1 point increase in the difference scores from the Post-AAC judgment to the Ideal judgment after partialling out the other variables' effects.

Since the open and synchronous variables were significant in the main effects model, an interaction term of open by synchronous was added to the third model to determine if the interaction was needed to explain the difference score changes. The interaction variable did not improve the model as it indicated little change in the proportion of variance explained,  $R^2 = .47$ . This overall model was also statistically significant, F(3, 38) = 11.34, p < .0005. (See the interaction column of Table 18 for the regression estimates.) The interaction term of open by synchronous was not statistically significant and was not used in subsequent modeling for this analysis. The Post-AAC synchronous variable also lost statistical significance in this model, probably due to multicollinearity with the interaction term as indicated by their significant bivariate correlation of .96.

A simple regression model with Post-AAC open paradigm predicting the change from the Post-AAC judgments and the Ideal judgments was also calculated, although the results from this interim model were not listed in Table 18. This simple model captured 37% of the variance in the outcome variable of cluster difference score. However, adding the Post-AAC synchronous paradigm captured an additional 9% of the variance. Thus, Post-AAC cluster scores for open and synchronous paradigm explains 46% of the variance in the difference score from the Post-AAC judgment to the Ideal judgment,  $R^2 = .46$ . The overall model obtained statistical significance, F(2, 39) = 16.34, p < .0005. (See the final column of Table 18 for the regression estimates.) The model generally appeared to meet the required error assumptions although the residuals are somewhat skewed and a few of the residuals violate heteroscedasticy. The fitted model was:

change in family paradigm (total cluster score difference from Post-AAC to Ideal) = 8.85 - 1.71open cluster from the Post-AAC judgment + .47synchronous cluster from the Post-AAC judgment.

Thus, this final model shows that the Post-AAC cluster score of open paradigms independently decreased 1.71 and the Post-AAC cluster score of synchronous paradigms independently increased .47 for every 1 point increase in the difference score while controlling the other variables' effects.

Satisfaction as a function of paradigm. In this satisfaction analysis, the primary caregiver's satisfaction rating (i.e., strongly dissastisfied, dissatisfied, neutral, satisfied, strongly satisfied) was used to create a 5-point ordinal outcome variable. The following a priori hypothetical model was the starting point for this analysis:

primary caregiver's satisfaction with child's AAC = intercept + $\beta_1$ closed cluster +  $\beta_2$ random cluster +  $\beta_3$ open cluster +  $\beta_4$ synchronous cluster +  $\beta_5$ severity of child's disability +  $\beta_6$ AAC ordinal variable +  $\beta_7$ family resources.

Seven predictors were used in this model: one for each Post-AAC paradigm and one for each of three possibly-confounding variables: child's disability, AAC use, and family income. This model explained more than one fourth of the variance in the satisfaction scores,  $R^2 = .28$ . However, the overall model was not statistically significant, F(7, 31) = 1.74, p = .14. (See the a priori model column of Table 19 for the regression estimates of this model.) As indicated by their nonsignificant regression coefficients, the potentially-confounding child, AAC, and family variables did not contribute to explaining the difference in AAC satisfaction. Therefore, these variables were not used in the subsequent multiple regression modeling for this analysis.

Next, a main effects model was evaluated with the predictors of Post-AAC closed, random, open, and synchronous paradigms. The Post-AAC cluster scores explained approximately one fourth of the variance in the satisfaction ratings,  $R^2 = .26$ , and this overall model was statistically significant, F(4, 37) = 3.19, p = .024. (See the main effects using the PA column of Table 19 for the regression estimates of this model.) As indicated by its significant negative regression coefficients, the Post-AAC cluster scores for the closed paradigm decreased .63 for every 1 point increase in the primary caregiver's satisfaction with the child's AAC system after partialling out the other variables' effects.

Satisfaction with the then current AAC system might also be related to the family's original, retrospective, Before-Diagnosis paradigm. Accordingly, a main effects model was evaluated with the predictors of Before-Diagnosis closed, random, open, and synchronous paradigms. Before-Diagnosis cluster scores explained more than one fourth of the variance in the satisfaction ratings,  $R^2 = .28$ , and this overall model was statistically significant, F(4, 37) = 3.58, p = .015. (See the main effects using the BD column of Table 19 for the regression estimates of this model.) As indicated by their significant negative regression coefficients, the Before-Diagnosis cluster scores for the closed paradigm independently decreased .38 and the Before-Diagnosis cluster scores of the random paradigm

independently increased .60 for every 1 point increase in the primary caregiver's satisfaction with the child's AAC system after partialling out the other variables' effects.

Satisfaction with the current AAC system could be related to the family's Ideal paradigm in the same way. Accordingly, a main effects model was evaluated with the predictors of Ideal closed, random, open, and synchronous paradigms. The ideal cluster scores explained nearly one third of the variance in the satisfaction ratings,  $R^2 = .30$ , and this overall model was statistically significant, F(4, 37) = 3.90, p = .01. (See the main effects using the I column of Table 19 for the regression estimates of this model.) As indicated by its significant regression coefficients, the Ideal cluster scores for the random paradigm increased .62 for every 1 point increase in the primary caregiver's satisfaction with the child's AAC system after partialling out the other variables' effects.

The next model combined the statistically significant predictors from the previous main effects models. These predictors included the cluster scores from Before-Diagnosis closed and random, from the Post-AAC closed, and from the Ideal random paradigms. These cluster scores explained over one half of the variance in the satisfaction ratings,  $R^2 = .52$ , and this overall model was statistically significant, F(4, 37) = 9.83, p < .0005. (See the combination column of Table 20 for the regression estimates of this model.) The Before-Diagnosis closed variable also lost statistical significance in this model, probably due to multicollinearity with the Post-AAC closed variable as suggested by their significant bivariate correlation. As indicated by their significant regression coefficients, the Post-AAC closed scores independently decreased .37, the Before-Diagnosis and the Ideal cluster scores of the random paradigm independently increased .42 and .62, respectively, for every

1 point increase in the primary caregiver's satisfaction with the child's AAC system after partialling out the other variables' effects.

Since the Post-AAC closed, the Before-Diagnosis random, and the Ideal random variables were significant in the combination model, four interaction terms (i.e., Post-AAC closed by Before-Diagnosis random, Post-AAC closed by Ideal random, Before-Diagnosis random by Ideal random, and Post-AAC closed by Before-Diagnosis random by Ideal random) were added to the next model to determine if the interaction terms were needed to explain the difference score changes. The interaction variables did not improve the model as indicated by the small change in the proportion of variance explained,  $R^2 = .53$ . This overall model was statistically significant, F(7, 34) = 5.56, p < .0005. (See the interaction column of Table 20 for the regression estimates.) None of the interaction terms were statistically significant, and thus, were not used in subsequent modeling for this analysis.

The final and most parsimonious model included only the significant predictors from the combination model described above. Consequently, the predictors included the cluster scores from the Before-Diagnosis Random, from the Post-AAC Closed, and from the Ideal Random paradigms. This final model of 3 predictors explained one half of the variance in the AAC satisfaction column,  $R^2 = .50$ . The overall model was statistically significant, F(3, 38) = 12.53, p < .0005. (See the final column of Table 20 for the regression estimates.) Although the residuals were somewhat skewed, the model generally appeared to meet the required error assumptions. The fitted model was:

primary caregiver's satisfaction with child's AAC = 1.21 - .47 closed cluster from the Post-AAC judgment + .38 random cluster from the Before-Diagnosis judgment + .65 random cluster from the Ideal judgment. Thus, this final model showed that the Post-AAC cluster scores for the closed paradigm independently decreased .47 and the Before-Diagnosis and Ideal cluster scores for the random paradigm independently increased .38 and .65, respectively, for every 1 point increase in the primary caregiver's satisfaction with the child's AAC system while controlling for the other variables' effects.

# Paradigm Resources and Goals

The overall paradigm cluster scores can also be broken into cluster scores for the resources, for the goals, and for the individual elements of time, space, energy, material control, affect, meaning, and content. Each individual element has its own cluster scores ranging from 0 to 5 for closed, random, open, and synchronous. (Table 21 lists the average paradigm cluster scores across the four judgments.)

For the Before-Diagnosis judgment, the average cluster scores for random and open paradigms were generally higher than closed and synchronous paradigms for the resource elements of time, space, energy, and material. The paradigms for the goal elements showed more variability: synchronous was highest for control, random was highest for affect, closed was highest for meaning, and open was highest for content.

When comparing the Before-Diagnosis judgment to the After-Diagnosis judgment, the highest average cluster score for time shifted from open to closed. In addition, the cluster score for random decreased between the two judgments. The highest average cluster score for space shifted slightly from random to open. While the highest cluster score for energy remained in the open paradigm, random and synchronous paradigms showed decreasing average cluster scores. The goal elements showed less change between the two judgments. While the highest average cluster score shifted from synchronous to random for control and from random to closed for affect, the highest average cluster scores for closed meaning and open content simply increased their size. Random meaning also saw a sizeable decrease from the Before-Diagnosis to the After-Diagnosis judgment.

The Post-AAC judgments of the individual elements showed a trend towards values more similar to the Before-Diagnosis judgments. Random and open were generally the highest cluster scores for the resource while the goal elements showed synchronous control; closed, random, and open affect; closed meaning, and open content.

The Ideal judgments included an average preference for open time, random space, open energy, and random material. For the goal elements, closed and open control; random and open affect; closed, random, open, and synchronous meaning; and open content were the highest average cluster scores.

### **CHAPTER 4**

#### Discussion

The chapter is divided into a discussion of the results, clinical implications, study limitations, further research needs, and conclusions. The research involved an initial investigation of family paradigm variables (Imig, 2000a) with a set of families of young AAC users. Caregivers were primarily white, non-Hispanic, and married to the child's other biological parent. The families showed some diversity in caregiver education level, occupation, geographical location, and income but were more highly educated than the general population and, thus, had higher incomes. Children had a variety of diagnoses but the largest proportion of diagnoses (e.g., developmentally-delayed, mental retardation, and autism or pervasive developmental disorder) involved cognitive challenges for the AAC user. The heterogeneity of the children's language skills is shown in Table 12.

### Discussion of Results

*Post-AAC paradigms*. The first research objective focused on the identification of family paradigm(s) that were being used by the families at the time of the study. The range of *AACF-PAS* cluster scores from 0 to 5 represents the family's increasing use of that particular paradigm from never to always. Most families used each of the four paradigms at least part of the time. In other words, very few families had a paradigm cluster score of zero. The results in Table 15 and Figure 2 are limited only to those paradigms used almost always or always by the family (i.e., paradigms with cluster scores equal to 5).

The Post-AAC results in Table 15 and Figure 2 revealed that the greatest percentage of families relied on open strategies, followed by random, then closed, and

finally synchronous strategies. Given the expectation that the open paradigm might be most consistent with AAC recommendations, the high use of an open paradigm within these AAC families was anticipated.

It was originally thought that the closed paradigm would be more frequent than the random paradigm due to the compatibility of predictable routines in AAC intervention with closed strategies. However, that prediction was not supported by these results. Instead, the random paradigm, which was employed by almost one half of the families, was the second most frequently reported paradigm. In this sample, random was found most often in combination with other paradigms, the most common combination being a random-open paradigm. Explanations for this might be that, regardless of which types of communication modes were used, the random-open family would be able to implement the necessary changes for AAC while continuing to value the unique voice of the child. Another explanation might be that the AAC families simply reflected the general population in the United States, for which a random-open paradigm is the most likely paradigm combination (Imig, 2000a, Ch. 9, p. 3)

The closed paradigm, which was less frequently used by families in this study, may be linked to unease with the use of nontraditional communication modes, such as sign, pictures, and VOCAs, as the primary communication vehicles. In addition, these closed families might have solved a misalignment between their closed paradigm strategies and the AAC recommendations by decreasing their reliance on closed and increasing their use of other paradigm strategies that they felt were a better fit. Few families indicated the use of a synchronous paradigm, which was always in combination with at least one other paradigm. The limited used of a synchronous paradigm is consistent with Imig's report

(2000a, Ch. 9, p. 4) that synchronous elements are employed by a small portion of the general population in the United States. Another possibility is that synchronous families, who tend not to rely upon spoken communication for successful family functioning, would be less likely to seek out speech-language pathology services.

It is unclear whether the paradigm distribution found in this research is related to AAC factors, is simply a reflection of the paradigm distribution for the general U.S. population, or exists for other reasons. While the theory of family paradigms is grounded in the assumption that the family's paradigms will affect all aspects of family's life including AAC, research is needed to confirm and expand this line of study. An example of this type of research might be a qualitative study where family members from different paradigms describe their reactions to different AAC recommendations and their subsequent decisionmaking processes about whether and how to employ AAC within the child's life.

Nearly half of the families in this study were combining two or more paradigms used always or almost always by them. The four paradigms can be viewed as varying along two scales: 1) cohesiveness, running from connected to separate, and 2) adaptability, running from structured to flexible (Imig, 2000a, Ch. 2, pp. 1-3, Ch. 9). Closed paradigms are connected and structured while random paradigms are separate and flexible, making these direct opposites. Likewise, open paradigms are connected and flexible while synchronous paradigms are separate and structured, making these direct opposites of each other.

The lack of commonality in the two scales gives the combinations of closedrandom paradigms and open-synchronous paradigms the greatest tension in merging paradigmatic views when compared to other paradigm combinations (Imig, 2000a, Ch. 9, pp. 2, 4). Contrast that to paradigms that share a similar location on one of the scales. For example, combining closed (i.e., connected and structured) and open (i.e., connected and flexible) paradigms results in the family being compatible in its pursuit for feeling connected but having tension in finding its appropriate level of adaptability, from structured to flexible. Similarly, combining random (i.e., separate and flexible) and synchronous (i.e., separate and structured) paradigms provides the family compatibility along the cohesiveness scale but creates tension along the scale of adaptability. Families will typically need to expend more resources to accomplish their goals when their combinations of paradigms are further apart from each other (Nugent & Constantine, 1988). See Imig (2000a, Ch. 9, pp. 1-12) for his discussion regarding each possible paradigm combination in compromise and compound family systems.

Changes in paradigms After-Diagnosis and Post-AAC. The second research objective was to explore whether families perceived any changes in their paradigms over time. Most paradigm difference scores were less than 2, and many of the paradigm changes appeared to be an adjustment in how the families balanced their paradigms rather than an outright rejection of their initial paradigm(s). For example, a family may have a difference score of 1 for random, representing a change from a cluster score of 5 to a 4. This would have indicated that the family switched from "always or almost always" using those strategies to "often" using those strategies.

In order to increase our understanding of these numerical shifts in cluster scores, future research could ask families with children of different ages for examples of when and why they are making these changes. Some possible patterns could include 1) that families with young children often go through this paradigm adjustment, 2) that this adjustment is unique to families with children who have special needs or to families in crisis, or 3) that these changes are not clinically significant. If families with children often make this adjustment, it could represent typical alterations that arise in the course of child rearing. If only families in crisis showed this change, it may represent changes imposed by the additional stressors of having a child with severe disabilities. If families are unable to identify examples of changes, then the changes in paradigm scores may not be related to clinically significant events in the family's life.

In Table 15 and in Figure 2, the pattern of paradigms with a cluster score of 5 shows that reliance on random views decreased while reliance on closed views increased as the family moved from not having a diagnosis to having a diagnosis for their child. Then, as the family moved to having their most recent AAC system, the frequency of closed paradigms decreased as random and open paradigms increased. This shift is consistent with Imig's hypothesis (2000a, Ch. 3, pp. 12-14) that closed strategies, which are efficient and based on past successes, might be initially employed when confronting a problem. However, if the problem becomes long-term and the established solutions did not achieve the desired outcomes, then the adaptive strengths from random and/or open strategies might be more successful. Random strategies may spontaneously create new and innovative ways from which the individual family members can explore the problem. Open strategies would include seeking out information from all possible avenues and requiring communication and consensus from all family members on the next plan of action.

These changes in family paradigms are consistent with a roller-coaster model of family crisis (Boss, 1987; Hill, 1949; Koos, 1946), which suggests that families become "disorganized" after a crisis, hit bottom, and then recover family functioning. The degree of

recovery or reorganization may be due to external factors, such as the type and severity of the crisis, and to internal factors, such as the family's paradigmatic worldview, cohesiveness, and/or available resources (Constantine, 1986, pp. 181-205; Duis, Summers, & Summers, 1997; Haveman, van Berkum, Reijnders, & Heller, 1997; Imig, 2000a, Ch. 9, pp.11-12, Ch.10, pp. 1-26; McCubbin, McCubbin, & Thompson, 1993; McCubbin & Patterson, 1983). The family's reorganization may be reflected in a change of cluster scores, representing a rebalancing of the family's use of different paradigms.

The pattern of retrospective judgments from before to after the child's diagnosis (see Table 16) shows that families who started with higher random and open paradigm scores had less overall change in their use of the four paradigms than those who initially relied less on random and open views of the world. In addition, results from Table 17 suggest that families using open strategies after the child's diagnosis reported smaller difference scores at the point of receiving their most-recent AAC system. These results may mean that families find open and random strategies compatible with the transition into special education. Families with open paradigms would likely be comfortable with the consultative, collaborative teaming process that underlies much of special education and AAC intervention (American Speech-Language-Hearing Association, 2004). Those with random paradigms would likely be accepting of the child, regardless of the child's strengths and weaknesses. In contrast, families with closed paradigms, looking for efficient and effective restoration to "normal," may be more reticent to accept the child's diagnosis and the subsequent changes in having "outsiders" participate in family decisions. In a similar way, those using synchronous paradigms may not see any need to change based on judgments from those outside the family's view. Consequently, families with closed or

synchronous views may feel misalignment between their paradigms and the practices of educational systems. Further research is needed to explore these possibilities.

Paradigm and AAC satisfaction. The third research objective focused on measuring family paradigm satisfaction and AAC satisfaction as a function of family paradigm. As shown in Table 18, families who used an open paradigm after receiving their then current AAC system were less likely to want to change their paradigm, as indicated by lower difference scores. In contrast, families who used a synchronous paradigm were more likely to have higher difference scores, suggesting that they would like to change their Post-AAC paradigm. This is consistent with the earlier suggestion that AAC recommendations may fit open family functioning better than synchronous family functioning.

Predicting AAC satisfaction was the focus of the results in Tables 19 and 20. Families, who relied on random strategies before the child was diagnosed and/or who would prefer to use random strategies in an ideal world, reported more satisfaction with the then current AAC system. In contrast, families who used closed strategies at the time of the then current AAC system reported less satisfaction with that system. Although further research is needed to replicate and explore these differences, the random and closed satisfaction differences may reflect how the family perceives the acceptability of alternative communication modes.

As seen in Table 11, three fourths of the primary caregivers indicated satisfaction with the child's AAC system. In transcripts from interviews and focus groups (VanBiervliet & Parette, 1999), family members have expressed the hope that the AAC system will allow their children to communicate more with the important people in their lives. However, it is difficult to know how quickly family members expect the AAC user's communication to

improve. Comparing family members' expectations and possible benchmarks with their family paradigm may further clarify this issue. For example, closed families might expect faster changes and be more quickly disappointed if the changes did not occur in a timely manner. On the other hand, open families might find incremental improvement encouraging and talk about practical ways to adjust the plan.

AAC early intervention practices. Although not a primary focus of this study, these results provide some interesting observations about AAC practices in early childhood. The parents in this study generally suspected problems early in their children's lives. In fact, nearly half of the children were under 1 year of age when symptoms of a disability arose. The subsequent diagnosis generally occurred during the first, second, or third year of the child's life. This raises the question of whether early AAC intervention was primarily implemented for children with obviously severe disorders or if this was simply an artifact of the convenience sample of this study.

The length of time for the acquisition of the first AAC systems varied. The average of one half year from diagnosis to first AAC acquisition was negatively skewed by families who used baby sign with their child before any problems were diagnosed. Other families saw five years pass between the diagnosis and the first AAC system. However, the median was still less than one year, indicating that some type of AAC system was often available within a relatively short period of time. However, because speech and language undergo a period of rapid growth during early childhood, the effect of any delay in implementing various AAC systems could be considerable. This issue requires further research.

In this study, sign language was the AAC mode used most often or always at home, although most of the AAC users had multimodal systems, including vocalization, gestures, pictures, and simple and complex VOCAs. Even though more than half of the AAC users had voice output AAC systems, less than half of those with voice output devices reported frequent use at home. It is unclear from this study if the families were satisfied with that level of use or if they were expecting increased use as the child grew more proficient with their language and AAC competencies.

The lack of consistency of AAC components and modes recommended for young AAC users is not surprising, since little evidence-based information currently exists to guide clinicians in choosing various AAC components. Furthermore, there is also limited evidence on various AAC components' resulting effects on speech and language development (Schlosser, 2003). Recommendations for using unaided or aided AAC as well as the role of voice output continue to be debated and researched (Bedrosian, 1997; Bondy & Frost, 2002; Kumin, 2003; Locke & Levin, 1999; Mirenda, 2003; Romski & Sevcik, 2003; Schlosser & Blischak, 2001; Sigafoos & Drasgow, 2001; Smith & Grove, 2003).

Eleven of the families used only unaided AAC in the form of sign language. When asked to give reasons why they were not using aided AAC, four of the answers were troubling: 1) child not ready and/or working on skills, 2) can't afford AAC or AAC not available, 3) not told, and 4) don't know why. The idea of a lack of aided AAC readiness implies that some prerequisite skills for AAC are necessary. This idea has generally been rejected in the AAC field (American Speech-Language-Hearing Association, 2004; National Joint Committee for the Communication Needs of Persons With Severe Disabilities, 2002). In addition, the lack of funding or adequately-trained personnel cannot be used as justification by educational systems for not providing appropriate AAC services (National Joint Committee for the Communication Needs of Persons With Severe Disabilities, 2002) although families and professionals may disagree on what constitutes appropriate AAC services. As a standard of practice, family members should receive information about the various aided and unaided AAC options. This information may be especially valued by open families. In conversations with the author, several primary caregivers expressed dismay at the length of time that passed before they became aware of the variety of aided AAC options that exist.

## Clinical Implications

Family paradigms theory has been found useful in couples and family therapy (Constantine, 1986, 1993a; Constantine & Israel, 1985; Imig, 2000a). After the *PAS* is completed by family members, the results are used as a starting point from which the professional will ask for family verification and examples of the different paradigm strategies (Imig, 2000a, Ch. 9, p. 6, Ch. 11). In a similar way, a speech-language pathologist could ask a couple or a family to each complete the *AACF-PAS*. By looking for patterns in the resulting paradigm cluster scores, the speech-language pathologist has a focus for the initial discussions on how different AAC systems and strategies may complement or be in conflict with the family's paradigm(s). This process will not supplant the need to talk with family members. Although the family paradigm scores provide the professional with insight on possible family issues to address, the family members will always be asked to validate or correct those initial insights with their own interpretation and examples.

Consider this illustration: When completing the AACF-PAS, a mother indicated two cluster score changes from her current to ideal functiong: Random decreased from 5 to 4 while open increased from 4 to 5. The speech-language pathologist, recognizing the pattern

of a possible decreased emphasis in individual change to an increased emphasis in group change, would explain this result and ask the mother if that was how she felt. The mother might explain that she has been searching the Internet and talking to many other mothers who are in a similar situation (Note: use of a random strategy), but that she feels her husband does not want to discuss what she has learned (Note: rejection of an open strategy). Thus, the speech-language pathologist would ask if the mother feels that it is time to bring people together to make a decision (Note: use of an open strategy). If the mother agrees, the mother may be signaling a need to move from random paradigm information gathering to open paradigm consensus-building. At that point, the mother probably does not desire additional information from the professional but may want the professional to facilitate a decision-making process. Of course, before proceeding, the speech-language pathologist would need to know if the husband as well as other important team members are willing to adopt this open paradigm strategy of group consensus.

In this example, the speech-language pathologist continued to perform typical professional duties. However, due to the patterns raised by the *AACF-PAS*, the speech-language pathologist was able to explore areas suggested by family paradigms that were likely to be important to this specific family member. Consequently, with family paradigms, the professional is able to provide family-centered intervention targeted to each family's individual pattern of resources and goals. By considering the goodness-of-fit for the AAC system within a particular family's manner of functioning, families and professionals may be able to improve their informed decision-making and obtain more compatible AAC systems for children with severe communication disorders.

*Paradigm resources and goals.* Although not the target of a specific research objective for this study, the paradigm changes for individual elements of time, space, energy, material, control, affect, meaning, and content may be useful in further specifying the effects of particular AAC recommendations on individual families. In this study, families' overall paradigm scores did not predict the importance of the individual elements for each family. Consequently, families and professionals will need to discuss each family member's scores from the elements to determine their possible effect on AAC recommendations. Imig (2000a, Ch. 11-12) has provided detailed instructions and examples for using the individual element scores from the *R-PAS* to help couples better understand their relationships. Using Imig's methodology, AAC case studies could be employed to document and evaluate similar procedures during AAC evaluations and implementations.

For example, imagine that a speech-language pathologist is working with a family whose 3-year-old has autism, resulting in a severe communication disorder. If the father indicated a high cluster score on the elements of synchronous meaning and on closed time (see Tables 1 and 2 for a summary of paradigmatic elements), the speech-language pathologist would want to check with him and other family members on how those elements are combined within the family. The speech-language pathologist would recognize that the pattern of synchronous (i.e., individual-continuity) and closed (i.e., group-continuity) suggests that this father has more movement from separate to connected on the cohesiveness scale but is likely on the structured side of the adaptability scale. Therefore, the speech-language pathologist might speculate that the synchronous meaning score suggests that this family implicitly knows what it values, while closed time suggests

that this family member wants time to be used in an efficient manner as determined by the head of the family. If these speculations are confirmed by the family, several possible AAC implementation topics would need exploration in light of this family's paradigmatic view of the world.

First, questions about the meaning of the child's severe communication disorder to the family would be important to discuss. The difficulty with this task is that the family members may see little reason to discuss their synchronous meaning with each other (because they already implicitly in agreement) and with the speech-language pathologist (who likely will be considered outside the family's boundaries). However, the speech-language pathologist realizes that the family is less likely to use their resources and goals for AAC implementation if the family does not have concerns about the child's communication skills. Thus, the speech-language pathologist must decide with the family if it is willing to look at its view of meaning. If not, they would then need to discuss the family's willingness to implement AAC at home and/or its preferences for AAC implementation within contexts outside of the family such as in the child's preschool. See Constantine and Israel (1985) for a case study that describes some of the challenges, opportunities, and actions they encountered with a synchronous family in family therapy.

Second, if the family is willing to implement AAC at home, the closed time element will need to be explored, especially with whomever is the head of the household (i.e., the mover). Using family paradigm theory, the speech-language pathologist will suspect that this mover is the gatekeeper for decisions about time use within the family. The mover will need to be asked about whether and how AAC recommendations could fit within existing routines without requiring an excessive amount of the family's time
resources. This process of identifying specific elements and discussing how they may influence AAC decision-making would continue especially for those elements that are higher ranked by the family. [See Imig (2000a, Ch. 12) for details on using ranked paradigm data within vector charts.]

The speech-language pathologist would never suggest that a synchronous (or a closed, random, or open) family will be unable to implement AAC. Instead, the professionals and the family members need to investigate where tensions could exist between the AAC recommendations and the family's preferred functioning. Being able to recognize any misalignment between the AAC implementation plans and the family paradigms should lead to trying to minimize the misalignment. If that is not possible, then, at least, everyone should be aware that the tensions from the misalignment will likely feel difficult to the family and will require more of the family's goals and resources to manage. If the original AAC implementation is not successful, the AAC team would ask the family for examples of the problems in order to further understand and minimize misalignments between the family's preferred paradigm(s) and the AAC system.

Note also that the speech-language pathologist's role in these examples is not to try to change the family's way of functioning, which is a difficult to impossible task. Instead, the role is to use the knowledge of communication disorders intervention and of family paradigms to work with a particular family and its child to uncover how AAC and communication intervention fit within what is already important to them, the very definition of being a family-centered professional. If this process is successful, any resulting AAC recommendations for the child should then be more naturally tailored to the

family's real world and, thus, be more likely to be implemented. Clinical case studies would provide important insight into the outcomes of this type of approach.

Family paradigms' effects on professional decision-making. Constantine (1986, pp. 390-392) proposed that professionals should become aware of their own paradigm preferences in order to guard against negatively judging other people's paradigm strategies. Some people may mistakenly believe that their own family functioning or paradigm should be adopted or avoided by their clients as the correct or incorrect model of family behavior.

Professionals should also consider whether they use a particular paradigm as an example of "appropriate" professional behavior. For example, some professionals may prefer a more expert or medical model where they diagnose a problem and prescribe a treatment. This may be consistent with closed paradigm behaviors. Other professionals may prefer an individualistic approach where the evaluation and treatment emerges as a creative product of this particular session. Such an approach appears to be consistent with a random paradigm. Still other professionals may prefer a more collaborative model where they assist communication and consensus among team members. This would be consistent with an open paradigm. Synchronous professionals would already be in tune with their clients without the need for overt communication, creating a harmonious and peaceful connection. The most effective professional is likely to be someone who, while recognizing his or her own paradigmatic preferences, is able to shift his or her strategies to validate and align with the clients' preferred paradigms.

Constantine (1991; 1993b) has also written about paradigmatic orientations within organizations and teams. This area of research could also be applied to the different environments and organizations with which the AAC user and the family interacts.

Similarly, Villarruel et al. (1995) proposed that early childhood educators should be educated about and subsequently validate the different paradigmatic views that are held by families. In addition, educators are then faced with finding ways to embrace and encourage all paradigmatic viewpoints that their students bring into the classroom.

For example, one preschool classroom could rely on more closed paradigm strategies such as explicit rules and structured routines. A different preschool classroom might employ random paradigm strategies such as encouraging each child to follow his or her interests. Another preschool classroom might use open paradigm strategies such as collaborative planning of the day's activities and the use of negotiation to resolve disagreements. In contrast, a preschool classroom employing synchronous strategies might have few written policies but would expect the children to fit into the natural rhythm of the place.

If the parents' and child's paradigm is different (i.e., misaligned) from the teacher's paradigm, more stresses are likely to occur. Without understanding that the stresses are coming from holding different views of the world, the family and teachers may find the tensions difficult to resolve. However, with an understanding of family paradigms, the teacher could better understand his or her own teaching style as emanating from a particular paradigmatic view and then be able to consider and implement practices that support and value all of her students' paradigms (Villarruel et al., 1995). More research is needed on the interaction effects of child, family, professional, and organizational paradigms within clinical intervention and special education practices.

#### Limitations of This Study

Although the present research demonstrated that family paradigms accounted for a significant amount of the variances in paradigm difference scores and AAC satisfaction ratings, several limitations need to be considered. Caution in interpreting multiple regression models is prudent as multiple regression will indicate only associative, not causal, relationships. Each of the final models described in Chapter 3 is underspecified. Therefore, additional variables need to be evaluated in order to improve the models to better predict changes in paradigm preferences and AAC satisfaction. Looking at different variables and using additional analysis tools such as structural equation modeling, hierarchical linear modeling, and logistic regression may improve the statistical models and increase our understanding of the relationships between family variables and AAC intervention. However, adding variables generally will require larger sample sizes, which are difficult and time-consuming to obtain on low-incidence populations such as AAC users.

The use of three long questionnaires, requiring 60 to 90 minutes of time, likely limited those who decided to participate in this study. For example, stay-at-home caregivers may feel they have more time to participate in research and may be overrepresented in this sample. Conversely, some researchers have proposed that, if possible, a parent, usually the mother, will try to stay home when the child(ren) are young (Heller, Hsieh, & Rowitz, 1997, p. 407; Huston & Vangelisti, 1995, p. 158). If that is true, then stay-at-home caregivers may be the majority, especially in two parent families of young children. Additional demographic research of AAC families could clarify this issue.

Some caregivers did not complete the AACF-PAS, which limited the paradigm results. Reasons included finding the directions confusing and the measure too time-consuming. These points should be considered in developing future versions of the AACF-PAS.

Although the results from this study suggest that many families perceive paradigm changes from prior to and after the child's diagnosis, the *AACF-PAS*'s methodology is limited by its retrospective nature for the Before- and After-Diagnosis judgments. Those results could be verified by future longitudinal studies. For example, a longitudinal study could follow at-risk children (e.g., neonatal intensive care survivors) from birth through the preschool years to determine any changes in family paradigms if communication disorders and/or AAC intervention occur. A longitudinal study would also be useful for detailing changes in the type and the use frequency of different communication modes during the birth to kindergarten time.

The lack of demographics regarding young AAC users, their families, and their environments limits knowing how representative this convenience sample is of the general population of young AAC users. It also limits generalization. Demographic studies that would increase our knowledge about young AAC users and their natural, humanconstructed, and social environments continue to be needed. The resulting demographics would, then, improve sampling strategies for additional studies about these young children and their families.

Little is known about paradigm changes in families with typically-developing young children. Perhaps families with any young children demonstrate similar perceptions of paradigm change that were seen in this study. Designs that include and compare families

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who have typically-developing young children and those who have young children with AAC needs would further clarify this issue.

#### Future Research Needs

Much work is needed in extending and evaluating this initial investigation. Some of the needs are specific to testing interactions between family paradigms and AAC practices, some suggestions are focused on improving our tools and knowledge of family paradigms, and some proposals are specific to improving our understanding of the demographics of families with young AAC users.

In addition to the qualitative and quantitative research ideas discussed earlier, the influence of the player parts of mover, challenger, follower and bystander (which was introduced briefly in Chapter 1) needs to be considered and researched in AAC decision-making. Interactions between paradigm type and player part within the family is one likely area of study. Another potential line of research is whether an individual maintains his or her paradigm and/or player part within different contexts such as the home, in medical or educational settings, and in other community environments.

Cultural and social class influences on family paradigms are another area that needs further study. The samples gathered in this study were generally from white, non-Hispanic females who had more college education and higher incomes than the general U.S. population. Although this sampling bias was not intended, it reflected the type of persons who responded to the survey. Therefore, future research can be driven by the question of whether the family paradigms used in this study are equally applicable to or generalizable to families in other cultural groups and social strata.

Villarruel et al. (1995) discussed some of the contextual effects of blending culture and family paradigms. One cannot predict a family's paradigm by simply observing the family's behavior because the same behavior could be motivated by different underlying reasons or different behaviors could result from the same underlying reason. They proposed that although family paradigms can exist within every culture, the family's choice of behaviors resulting from a given paradigm may differ due to cultural influences. One of their examples contrasts two families, both using a closed paradigm to grieve the death of a family member. The European American family members were struggling not to cry while the Lebanese family members were wailing loudly. While both families employed traditional grieving behaviors emanating from their closed paradigm, the resulting behaviors appeared different due to their different cultural backgrounds.

Although culture and family paradigms are integrally connected, Stockman, Boult, and Robinson (2004) cautioned that cultural influences are seldom monolithic. Instead, people from different cultural groups may share some experiences and values but not others. Similarly, people from different social classes may share some features but not others. A common example is that two people may share a particular ethnic background but have differing educational experiences. Another example is that two people can have a similar social class but different values about the role of money in their lives. In light of the complexity of defining culture and social class, researchers need to recognize the multiple bases on which people form shared connections when exploring whether family paradigm theory as applied in the present study has cross-cultural and social relevance. In addition, professionals must be sensitive to multiple contextual influences, including the culture in which family paradigms exist, that affect a child's development. This contextual approach

to culture and family paradigms needs to be integrated with the growing body of literature on culture and AAC. (See the concept paper contained in VanBiervliet & Parette, 1999, for a review of some of the cultural issues in AAC.)

In order to increase the functionality of the *AACF-PAS*, several areas should be addressed, including improving its ease of use, measuring the test-retest reliability, simplifying instructions and possible scale items, and creating easily-understood results summaries for family members. Having multiple caregivers within the same family complete the *AACF-PAS* should improve the understanding of that particular family's functioning. Getting all the caregivers to complete the surveys can be difficult logistically. More research is needed on how to quantify if the family system is compromise or compound.

Conducting demographic research that describes the characteristics of young AAC users, their families, and their environments could provide important insights into the use of AAC within early intervention as well as improve sampling strategies for future research projects. For example, determining the percentage of different communication modes recommended and implemented for young children with different diagnoses as well as the underlying rationales would further expand our understanding of current practices.

Although using multimodal systems is a widely accepted AAC practice (American Speech-Language-Hearing Association, 2004; Sigafoos & Drasgow, 2001), limited research exists on which AAC components to combine. In addition, little is known about the effect of order and timing when introducing new communication modes. As seen in Table 8, three fourths of the AAC users in this study had acquired a new AAC system with an average of a year between the first and the most recent systems. However, the time

varied from less than a year to four years between the two events. Unfortunately, details about any AAC introduced but subsequently discontinued was not collected in this study. In addition, this research did not capture the AAC acquisition order and underlying rationale for recommending specific AAC systems, which would be useful to consider in future research. Possible options include a) starting with one mode and adding to it as the child shows communicative competence, b) starting with one mode and adding to it if the communication environment warrants a different approach, c) moving from unaided to aided modes, d) moving from aided to unaided modes, e) discontinuing one mode and starting another mode, and f) starting several modes at the same time.

In addition, families with young AAC users could be included in studies that also collect data from families of typically-developing young children. While increasing our knowledge about the range and change of family functioning in general, the data could also be compared and contrasted to families whose young children exhibit severe communication disorder.

#### Conclusions

As seen in this initial research, family paradigm theory may provide a useful framework within which to research and clinically intervene with families of young AAC users. The different worldviews of closed, random, open, and synchronous may lead to differing familial strengths, barriers, needs, and supports. For example, finding ways to increase AAC satisfaction, especially with closed and synchronous paradigms, may be necessary if the models from this initial study are replicated. The influence of different family elements of time, space, energy, material, control, affect, meaning, and content need to be further explored within AAC families and their daily lives. AAC research and clinical intervention require the considerations of multiple factors including the characteristics of the AAC user, the AAC system, the family, other communication partners, and communication environments. Family paradigms theory extends the family-centered literature by providing an efficient framework for discussing family structure and for improving family-centered practice. AAC clinical interventions that employ the theory of family paradigms also need to be explored.

In conclusion, the recognition that families make decisions based on different, but equally valid views of the world allows the multi-pardigmatic professional to tailor recommendations to a specific family. Ultimately, identifying the paradigms of professionals, clients, their families and significant others, and their environments has the potential to improve clinical services for all people with communication disorders, including AAC users. **APPENDICES** 

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#### **APPENDIX A**

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Tables and Figures

Paradigm elements	Closed	Random	Open	Synchronous
Resources Time	Plan and follow schedule	Spontaneous and individually changing	Balance individual and group needs	Subconsciously understood
Space	Structured with only traditional ideas accepted	Flexible with any and all ideas acceptable	Practical; exploring ideas as long as any conflict is resolved	Integrated and seamless
Energy	Constant, predictable flow	Fluctuating; enthusiastic flow	Changing and adapting to individual and group needs	Peaceful and harmonious flow
Material	Important and valued, symbolizes achievement and status	Avoided when possible because they can complicate relationships	Practical and useful	Preserved for their inherent value

Table 1. Comparison of resources by paradigm.

Note: Descriptions based on Constantine (1986) and Imig (2000a).

Paradigm elements	Closed	Random	Open	Synchronous
Goals			······································	
Control	By organization and structure, discipline	Individually- determined	Discussion leading to consensus action	Implicitly know how and when to complete
Affect	Private, conventional	Spontaneous, demonstrative	Sensitive, responsive	Understood without words and actions
Meaning	Found within "traditional" values	Found within following one's own instincts and path	Found by doing what is effective and pragmatic	Found by following timeless universals
Content	Time-tested rules	Individually- created, relative	Ask, share, and agree, constructionist	Absolutes, "what is, is"

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Table 2. Comparison of goals by paradigm

Note: Descriptions based on Constantine (1986) and Imig (2000a).

Table 3. A	ge, gender, race, an	d ethnicity o	f AAC users an	d caregivers			
Variable	Category	All AAC Users N=55	AACF-PAS AAC Users <sup>a</sup> N=43	All Primary Caregivers (PC) N=54	AAC F-PAS PC <sup>a</sup> N=42	All Secondary Caregivers (SC) N=54	AAC F-PAS SC <sup>a</sup> N=42
Age	Mean Median Standard deviation Minimum Maximum	47 months 46 months 15 months 15 months 75 months	48 months 47 months 13 months 19 months 71 months	36 years 35 years 6 years 23 years 53 years	35 years 35 years 5 years 23 years 46 years	38 years 36 years 7 years 26 years 58 years	37 years 36 years 6 years 26 years 49 years
Gender	Female Male	19 36	16 27	54 0	42 0	0 54	0 42
Race and/or Ethnicity	American Indian or Alaskan native Asian/Native Hawaiian or Other Pacific Islander	3 5	m 5			7 -	1 2
	Black/African American	0	0	0	0	0	0
	Caucasian/White	55	43	53	41	51	41
	Hispanic/Latino	-	0	0	0	I	0
	No response	0	0	0	0	-	0
Note. AACF	-PAS indicates the subse	et of families wi	ith completed family	y paradigm data.			

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b Note. Due to a no response for age of one of the SC, the age results for the column "All Secondary Caregivers (SC)" was based on n=53.

c Note. Respondents were asked to select all that apply.

Variable	Category	All Primary Caregivers (PC) N=54	AAC F-PAS PC <sup>a</sup> N=42	All Secondary Caregivers (SC) N=54	AAC F-PAS SC <sup>a</sup> N=42
Highest	Grade school only	0	0	0	0
educational level attained	Some high school	0	0	2	1
	High school graduate	5	4	5	5
	Vocational school graduate	1	1	0	0
	Some college	12	9	11	7
	College graduate	13	11	16	14
	Some graduate school	9	7	3	3
	Advanced degree	14	10	16	12
	No response	0	0	1	0
b Employment	Business owner/ Self-employed	5	3	7	5
	Full-time employee	10	7	41	33
	Part-time employee	11	7	2	1
	Stay-at-home caregiver	33	27	2	1
	Student	3	3	1	1
	Unemployed	1	1	0	0
	No response	0	0	1	0

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Table 4. Caregivers' education level and employment

a Note. AACF-PAS indicates the subset of families with completed family paradigm data.

b Note. Respondents were asked to select all that apply.

Variable	Category	All Families N=54	a AAC F-PAS Families N=42
Number of siblings	Zero	16	13
	One	· 19	13
	Two	13	11
	Three	5	4
	Four	1	1
Number of children with	One	47	37
a disability	Two	5	3
(including AAC user)	Three	2	2
Number of adults living	One	1	1
in the house	Two	50	39
	Three	2	2
	Four	1	0
Language spoken	English	54	42
at home	Spanish	1	0
	Other	0	0
Family income	Under \$10,000	0	0
-	\$10,000 to 19,999	3	3
	\$20,000 to 39,999	5	5
	\$40,000 to 59,999	14	10
	\$60,000 to 99,999	15	9
	\$100,000 to 149,999	10	8
	Over \$150,000	4	4
	Prefer not to answer	3	3
Geographical location	Farm	1	0
(population density)	Rural, but non-farm	7	7
	Town, not part of a metro area (under 50.000)	12	12
	Small city (50,000 to 99,999)	10	6
	Medium city (100,000 to 299,999)	10	6
	Large city (over 300,000)	14	11

# Table 5. Family size, language(s) spoken, income, and geographical location

a Note. AACF-PAS indicates the subset of families with completed family paradigm data.

b Note. Respondents were asked to select all that apply.

Variable	Category	All	AACF-PAS
		AAC Users	AAC Users <sup>a</sup>
		N=55	N=43
Diagnosis	Angelman syndrome	2	2
Diagnosis	Apraxia	18	14
	Autism or Pervasive developmental disorder	16	14
	Cerebral palsy	9	7
	Developmental delay	33	25
	Down syndrome	9	5
	Dual sensory impairment (deaf-blind)	0	0
	Dysarthria	1	1
	Hearing impairment-temporary	7	4
	Hearing impairment-permanent	1	0
	Medically fragile	6	2
	Mental retardation	18	13
	Rett syndrome	2	2
	Rubenstein Taybi syndrome	3	3
	Seizure disorder	7	6
	Sensory integration disorder	2	2
	Traumatic brain injury	0	0
	Visual impairment not corrected by glasses	2	1
	Cause unknown	3	3
	Other neurological disorder	4	4
Severity of the	Mild	8	6
child's disability as it	Moderate	31	25
affects the family's daily activities	Severe	16	12
b Educational cotting	Home visits by early interventionists	24	20
Educational setting	Self-contained preschool	27	23
	Integrated preschool	23	18
	None	1	1
	Other	8	7

Table 6. Child's diagnosis, the severity of disability on family's daily activities, and child's educational setting

a Note. AACF-PAS indicates the subset of families with completed family paradigm data.

b Note. Respondents were asked to select all that apply.

Variable	Category	All AAC Users N=55	AACF-PAS AAC Users <sup>a</sup> N=43
Child's age	Less than 1 year old	27	21
when problem	1 year through 1 year, 11 months	22	20
first suspected	2 years through 2 years, 11 months	6	2
	3 years through 3 years, 11 months	0	0
	4 years through 4 years, 11 months	0	0
	5 years through 5 years, 11 months	0	0
	6 years through 6 years, 11 months	0	0
Child's age	Less than 1 year old	17	11
when diagnosed	1 year through 1 year, 11 months	15	14
	2 years through 2 years, 11 months	17	14
	3 years through 3 years, 11 months	3	2
	4 years through 4 years, 11 months	1	0
	5 years through 5 years, 11 months	0	0
	6 years through 6 years, 11 months	0	0
	No response	2	2
Child's age when AAC first acquired	Less than 1 year old	9	4
	1 year through 1 year, 11 months	16	14
	2 years through 2 years, 11 months	18	16
	3 years through 3 years, 11 months	10	8
	4 years through 4 years, 11 months	0	0
	5 years through 5 years, 11 months	2	1
	6 years through 6 years, 11 months	0	0
Child's age	Still using first AAC system	15	10
when current	Less than 1 year old	0	0
AAC acquired	1 year through 1 year, 11 months	4	3
	2 years through 2 years, 11 months	14	11
	3 years through 3 years, 11 months	10	8
	4 years through 4 years, 11 months	11	10
	5 years through 5 years, 11 months	1	1
	6 years through 6 years, 11 months	0	0

Table 7. Frequency of child's age when problem suspected, diagnosed, and AAC received

a Note. AACF-PAS indicates the subset of families with completed family paradigm data.

Variable		All	AACF-PAS AAC
		AAC Users	Users a
Length of time from when	N	55	43
problem first suspected to first	Mean	1.1 years	1.2 years
AAC system	Median	1.0 year	1.0 year
	Standard deviation	1.1 years	1.1 years
	Minimum	-1 year	-1 year
	Maximum	5 years	5 years
Length of time from when	N	53	41
diagnosed to first AAC system	Mean	0.5 year	0.6 year
	Median	< 1 year	< 1 year
	Standard deviation	1.1 years	1.1 years
	Minimum	-2 years	-1 year
	Maximum	5 years	5 years
Length of time from when AAC	N	40	33
first acquired to current AAC	Mean	1.2 years	1.2 years
system	Median	1.0 year	1.0 year
	Standard deviation	0.9 years	1.0 years
	Minimum	< 1 year	< 1 year
	Maximum	4 years	4 years
Length of time from when	N	40	33
problem first suspected to current	Mean	2.2 years	2.2 years
AAC system	Median	2.0 years	2.0 years
	Standard deviation	1.1 years	1.1 years
	Minimum	1 year	1 year
	Maximum	5 years	5 years
I ength of time from when	N	38	31
diagnosed to current AAC system	Mean	1 5 years	1 5 years
	Median	2.0 years	1.0 years
	Standard deviation	1.1 years	1.2 years
	Minimum	< 1 vear	< 1 vear
	Maximum	4 vears	4 vears
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Table 8. Length of time from when problem suspected, diagnosed, and AAC received

a Note. AACF-PAS indicates the subset of families with completed family paradigm data.

Variabl <del>e</del>	Category	All AAC Users N=55	AACF-PAS AAC Users N=43
b Sign Language	Alone	11	8
	In combination with communication pictures and/or boards	7	4
	In combination with communication books	0	0
	In combination with simple VOCA	1	1
	In combination with complex VOCA	3	3
	In combination with communication pictures, boards and/or books	4	3
	In combination with communication pictures, boards, and/or books AND with simple VOCAs	9	7
	In combination with communication pictures, boards, and/or books AND with complex VOCAs	6	6
	In combination with simple VOCAs AND with complex VOCAs	1	1
	In combination with communication pictures, boards, and/or books AND with simple VOCAs AND with complex VOCAs	3	3
	Total sign language users	45	36

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## Table 9. Type of AAC system currently available

a Note. AACF-PAS indicates the subset of families with completed family paradigm data.

b Note. Respondents were asked to select all that apply.

Variable	Category	All AAC Users N=55	AACF-PAS AAC Users N=43
Communication	Alone	1	1
pictures and/or b	In combination with sign	7	4
boards	In combination with communication books	1	1
	In combination with simple VOCA	1	1
	In combination with complex VOCA	2	0
	In combination with sign AND communication books	4	3
	In combination with sign AND with simple VOCAs	5	3
	In combination with sign AND with complex VOCAs	6	6
	In combination with communication books AND with simple VOCAs	1	1
	In combination with simple VOCAs AND with complex VOCA	1	1
	In combination with sign AND with communication books AND with simple VOCAs	4	4
	In combination with sign AND with communication books, AND with complex VOCAs	0	0
	In combination with sign AND with simple VOCAs AND with complex VOCAs	1	1
	In combination with communication books AND with simple VOCAs AND with complex VOCAs	1	1
	In combination with sign AND with communication books AND with simple VOCAs AND with complex VOCAs	2	2
	Total communication pictures and/or boards users	37	29

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## Table 9. (continued)

a Note. AACF-PAS indicates the subset of families with completed family paradigm data. b Note. Respondents were asked to select all that apply.

Table 9. (continued)

Variable	Category	All AAC Users N=55	AACF-PAS AAC Users N=43
Communication	Alone	0	0
books	In combination with sign	0	0
	In combination with communication pictures and/or boards	1	1
	In combination with simple VOCA	0	0
	In combination with complex VOCA	0	0
	In combination with sign AND with communication pictures and/or boards	4	3
	In combination with communication pictures and/or boards AND with simple VOCAs	1	1
	In combination with sign, communication pictures and/or boards, AND with simple VOCAs	4	4
	In combination with communication pictures and/or boards AND with simple VOCAs AND with complex VOCAs	1	1
	In combination with sign, communication pictures and/or boards AND with simple VOCAs AND with complex VOCAs	2	2
	Total communication book users	13	12

a Note. AACF-PAS indicates the subset of families with completed family paradigm data. b Note. Respondents were asked to select all that apply.

Table 9. (continued)

Variable	Category	All AAC Users N=55	AACF-PAS AAC Users N=43
Simple	Alone	0	0
VOCAs	In combination with sign	1	1
	In combination with communication pictures and/or boards	1	1
	In combination with communication boards	0	0
	In combination with complex VOCA	0	0
·	In combination with sign AND with communication pictures and/or boards	5	3
	In combination with sign AND with complex VOCAs	1	1
	In combination with communication pictures and/or boards AND with books	- -	1
	In combination with communication pictures and/or boards AND with complex VOCAs	1	1
	In combination with sign, communication pictures and/or boards, AND with books	4	4
	In combination with sign, communication pictures and/or boards AND with complex VOCAs	1	1
	In combination with communication pictures, boards, and/or books AND with books AND with complex VOCAs	1	1
	In combination with sign AND with communication pictures, boards, and/or books AND with books AND with complex VOCA	2	2
	Total simple VOCA users	18	16

a Note. AACF-PAS indicates the subset of families with completed family paradigm data.

b Note. Respondents were asked to select all that apply.

Variable	Category	All AAC Users N=55	AACF-PAS AAC Users <sup>a</sup> N=43
Complex	Alone	2	1
VOCAs	In combination with sign	3	3
	In combination with communication pictures and/or boards	2	0
	In combination with communication boards	0	0
	In combination with simple VOCA	0	0
	In combination with sign AND with communication pictures and/or boards	6	6
	In combination with sign AND with simple VOCAs	1	1
	In combination with communication pictures and/or boards, AND with simple VOCAs	1	1
	In combination with sign, communication pictures and/or boards, AND with books	0	0
	In combination with sign, AND with communication pictures and/or boards AND with simple VOCAs	1	1
	In combination with communication pictures and/or boards AND with books AND with simple VOCAs	1	1
	In combination with sign AND with communication pictures and/or boards AND with books AND with simple VOCA	2	2
	Total complex VOCA users	19	16

Table 9. (continued)

a Note. AACF-PAS indicates the subset of families with completed family paradigm data.

b Note. Respondents were asked to select all that apply.

Communication Mode	Used at home?	All AAC Users N=55	AACF-PAS AAC Users <sup>a</sup> N=43
Vocalizations	Never	2	2
	Rarely	5	4
	Sometimes	16	13
	Often	24	18
	Always	8	6
	Not available	0	0
Speech or speech	Never	12	10
approximations	Rarely	10	7
	Sometimes	16	13
	Often	16	13
	Always	1	0
	Not available	0	0
Pointing or	Never	7	7
gesturing	Rarely	7	5
	Sometimes	10	9
	Often	24	17
	Always	7	5
	Not available	0	0
Sign Language	Never	0	0
	Rarely	5	4
	Sometimes	10	8
	Often	26	21
	Always	4	3
	Not available	10	7
Communication	Never	4	4
pictures and/or	Rarely	9	6
ovards	Sometimes	15	11
	Often	8	7
	Always	1	1
	Not available	18	14

## Table 10. Usage of communication modes at home

a Note. AACF-PAS indicates the subset of families with completed family paradigm data.

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Communication Mode	Used at home?	All AAC Users N=55	AACF-PAS AAC Users a N=43
Communication	Never	0	0
books	Rarely	6	6
	Sometimes	7	6
	Often	0	0
	Always	0	0
	Not available	42	31
Simple VOCAs	Never	5	5
	Rarely	5	5
	Sometimes	3	2
	Often	4	3
	Always	0	0
	No Response	1	1
	Not available	37	27
Complex VOCAs	Never	2	2
	Rarely	2	1
	Sometimes	7	6
	Often	6	6
	Always	2	1
	Not available	36	27

Table 10. (continued)

a Note. AACF-PAS indicates the subset of families with completed family paradigm data.

Variable	Category	All AAC Users N=55	AACF-PAS AAC Users N=43
Ordinal AAC-use	No AAC components used	14	10
variable	Only unaided AAC components (sign language)	26	20
(based on AAC components used	Only no technology AAC (communication pictures, boards, books)	5	5
often or always at home)	Only low technology AAC (simple VOCAs)	0	0
	Only direct select computer-based (complex VOCAs)	2	1
	Only non-direct select computer-based (complex VOCAs)	0	0
	Multimodal combinations	8	7
Satisfaction with	Strongly dissatisfied	4	4
first AAC system	Dissatisfied	3	3
	Neutral	15	15
	Satisfied	22	16
	Strongly satisfied	11	5
Satisfaction with	Still using only first AAC system	15	10
current AAC system	Strongly dissatisfied	1	1
	Dissatisfied	5	4
	Neutral	6	5
	Satisfied	17	13
	Strongly satisfied	11	10
Satisfaction with	Strongly dissatisfied	1	1
first and/or current	Dissatisfied	5	4
AAC system	Neutral	8	7
	Satisfied	22	17
	Strongly satisfied	19	14

# Table 11. Ordinal AAC-use and AAC satisfaction

a Note. AACF-PAS indicates the subset of families with completed family paradigm data.

Variable	Category	All AAC Users N=55	AACF-PAS AAC Users N=43
Overall b	Follows requests and directions without assistance	25	20
	Makes requests spontaneously	36	29
	Responds to comments appropriately	24	18
	Makes comments spontaneously	14	12
	Answers questions appropriately	19	17
	Asks questions spontaneously	8	6
	Responds to communication by others but does not initiate communication	12	7
	Does not spontaneously communicate	14	10
Number of	None	2	2
words produced	Few (approximately 1 to 9)	15	12
independently	Several (approximately 10 to 50)	18	13
	Many (more than 50)	20	16
Utterance	Uses single words	36	28
b length	Uses two-word utterances	22	16
	Uses three-word or longer utterances	10	7
	Constructs grammatically correct sentences	3	3
	Does not communicate in any of these ways	4	4

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# Table 12. Child's language skills with or without AAC

a Note. AACF-PAS indicates the subset of families with completed family paradigm data.

b Note. Respondents were asked to select all that apply.

Variable	Category	All AAC Users n=11	AACF-PAS AAC Users n=8
b Reasons	Child talks, signs, or gestures	7	6
	Child not ready and/or working on skills	2	2
	Can't afford AAC or AAC not available	1	1
	Child quit using	0	0
Waiting for trial period	Waiting for AAC assessment or in AAC trial period	1	1
	AAC ordered/Waiting for delivery	0	0
	AAC is broken/Waiting for repairs	0	0
	Not told	5	3
	Don't know why	2	1

### Table 13. Reasons why the child does not use aided AAC

a Note. AACF-PAS indicates the subset of families with completed family paradigm data.

b Note. Respondents were asked to select all that apply.

Variable	Category	All AAC Users N=55	AACF-PAS AAC Users <sup>2</sup> N=43
Type of	Printed words	27	19
picture(s)	Black and white line drawings	25	20
or symbol(s)	Color line drawings	32	27
	Color photographs	31	25
	Black and white photographs	5	3
	Raised or textured symbols	3	3
	Parts of actual objects	5	2
	Full-sized actual objects	3	2
	Miniature objects	7	4
Selection b	Points or touches pictures with finger or other body part	41	32
mediod(3)	Looks at the picture (eye gaze)	14	11
	Uses a joystick	0	0
	Uses 1 switch	2	2
	Uses 2 or more switches	3	2
	Uses optical pointer, light beam, or head mouse	0	0
	Uses head stick or chin stick	1	0
	Uses standard keyboard	2	2
	Uses alternate keyboard	1	1
	Uses touch screen	10	9
	Uses encoding	0	0
	Other	0	0
Voice output	Yes	31	26
·	No	24	17
Funding	By the school or other educational agency	25	19
b source(s)	By a non-profit organization	3	3
	By health insurance	4	4
	By Medicaid or Medicare	9	7
	By our family	15	15
	By community fundraisers	0	0
	Other	3	2

#### Table 14. Aided AAC components and funding sources

a Note. AACF-PAS indicates the subset of families with completed family paradigm data. b Note. Respondents were asked to select all that apply.

#Paradigms per Family	a Paradigm	B Di	lefore- agnosis	D	After- iagnosis	]	Post- AAC	I	deal
	-	n	%	n	%	n	%	n	%
One	Closed (C)	3	7%	9	21%	5	12%	0	0%
One	Random (R)	9	21%	6	14%	5	12%	5	12%
	Open (O)	8	19%	9	21%	12	29%	15	36%
	Synchronous (S)	1	2%	2	5%	0	0%	0	0%
Two	CR	2	5%	0	0%	0	0%	0	0%
	CO	2	5%	7	17%	3	7%	2	5%
	CS	2	5%	0	0%	0	0%	0	0%
	RO	7	17%	7	17%	10	24%	16	38%
	RS	0	0%	0	0%	0	0%	0	0%
	OS	2	5%	0	0%	1	2%	0	0%
Three	CRO	4	10%	1	2%	3	7%	2	5%
or four	CRS	2	5%	0	0%	0	0%	0	0%
	ROS	0	0%	0	0%	0	0%	1	2%
	COS	0	0%	1	2%	1	2%	0	0%
	CROS	0	0%	0	0%	2	5%	1	2%
	Total	42	100%	42	100%	42	100%	42	100%

J

## Table 15. Frequency and percentage of paradigms by judgment

Note. Based on the subset of 42 families with completed family paradigm data.

<sup>a</sup>Note. Paradigm category is defined as a cluster score of 5.

Regression models to predict difference scores from Before- to After-Diagnosis						
Predictors	A priori Model <sup>†</sup>	Main Effects <sup>†</sup>	Interaction <sup>††</sup>	Final <sup>††</sup>		
BD paradigms:			·····			
Closed BD	40 (22)	23 (12)				
Random BD	98 <sup>†</sup> (36)	76 <sup>†</sup> (30)	-3.35 (-1.30)	73 <sup>†</sup> (29)		
Open BD	-1.05 <sup>††</sup> (51)	93 <sup>††</sup> (46)	-3.61 (-1.78)	93 <sup>††</sup> (46)		
Synchronous BD	.28 (.19)	.19 (.14)				
Random BD* Open BD			.59 (1.56)			
Statistically-controlling for:						
Severity of disability	40 (14)					
Ordinal AAC use	05 (05)					
Income	16 (12)					
Intercept	14.21	10.63	22.12	10.21		
R <sup>2</sup> Adjusted R <sup>2</sup>	.34 .19	.28 .20	.28 .22	.26 .22		

Table 16. Summary of multiple regression analysis to predict changes in family paradigm as a function of the Before-Diagnosis (BD) paradigm

*Note.* Unstandardized regression coefficients are reported for predictor variables with standardized coefficients shown in parentheses underneath the unstandardized regression coefficient.  ${}^{t}p \leq .05$ .  ${}^{tt}p \leq .01$ .  ${}^{ttt}p \leq .001$ .

Regression models to predict difference scores from After-Diagnosis to Post-AAC				
Predictors	A priori Model	Main Effects <sup>†</sup>	Final <sup>†</sup>	
AD paradigms:				
Closed AD	71 <sup>†</sup> (36)	61 (31)		
Random AD	52 (26)	56 (28)		
Open AD	81 <sup>†</sup> (39)	73 <sup>†</sup> (34)	79 <sup>†</sup> (37)	
Synchronous AD	.06 (.03)	.09 (.06)		
Statistically-controlling for:				
Severity of disability	.61 (.20)			
Ordinal AAC use	.02 (.02)			
Income	19 (15)			
Intercept	10.27	9.99	5.75	
R <sup>2</sup> Adjusted R <sup>2</sup>	.31 .16	.24 .16	.14 .12	

Table 17. Summary of multiple regression analysis to predict changes in family paradigm as a function of After-Diagnosis (AD) paradigm

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Note. Unstandardized regression coefficients are reported for predictor variables with standardized coefficients shown in parentheses underneath the unstandardized regression coefficient.  $^{\dagger}p \leq .05$ .  $^{\dagger\dagger}p \leq .01$ .  $^{\dagger\dagger\dagger}p \leq .001$ .

Regression models to predict difference scores from Post-AAC to Ideal						
Predictors	A priori Model <sup>†††</sup>	Main Effects <sup>†††</sup>	Interaction <sup>†††</sup>	Final <sup>ttt</sup>		
PA paradigms:						
Closed PA	10 (05)	01 (004)				
Random PA	38 (16)	51 (22)				
Open PA	-1.72 <sup>†††</sup> (70)	-1.81 <sup>†††</sup> (74)	-1.29 <sup>†</sup> (53)	-1.71 <sup>***</sup> (70)		
Synchronous PA	.29 (.17)	.52 <sup>†</sup> (.35)	1.47 (.98)	.47 <sup>†</sup> (.31)		
Open PA* Synchronous PA			22 (75)			
Statistically-controlling for:						
Severity of disability	.55 (.18)					
Ordinal AAC use	23 (23)					
Income	.04 (.03)					
Intercept	10.46	11.33	7.01	8.85		
R <sup>2</sup> Adjusted R <sup>2</sup>	.57 .47	.50 .45	.47 .43	.46 .43		

Table 18. Summary of multiple regression analysis to predict changes in family paradigm as a function of Post-AAC (PA) paradigm

Note. Unstandardized regression coefficients are reported for predictor variables with standardized coefficients shown in parentheses underneath the unstandardized regression coefficient.  ${}^{\dagger}p \le .05$ .  ${}^{\dagger\dagger}p \le .01$ .  ${}^{\dagger\dagger\dagger}p \le .001$ .

	Regression r	nodels to predict AAC	C satisfaction	
Predictors	A priori Model using PA	Main Effects using PA <sup>†</sup>	Main Effects using BD <sup>†</sup>	Main Effects using I <sup>††</sup>
Paradigms:				
Closed	56 <sup>†</sup> (46)	63 <sup>††</sup> (50)	38 <sup>†</sup> (35)	43 (32)
Random	.24 (.19)	.10 (.08)	.60 <sup>††</sup> (.39)	.62 <sup>†</sup> (.44)
Open	04 (03)	05 (04)	04 (03)	.20 (06)
Synchronous	.10 (.11)	.13 (.15)	004 (004)	.10 (.11)
Statistically- controlling for:				
Severity of disability	.12 (.07)			
Ordinal AAC use	06 (10)			
Income	05 (07)			
Intercept	5.17	5.86	2.87	1.47
R <sup>2</sup> Adjusted R <sup>2</sup>	.28 .12	.26 .18	.28 .20	.30 .22

Table 19. Summary of multiple regression analysis to predict AAC satisfaction as a function of family paradigm: A priori and main effects models

Note. Unstandardized regression coefficients are reported for predictor variables with standardized coefficients shown in parentheses underneath the unstandardized regression coefficient.  ${}^{\dagger}p \le .05$ .  ${}^{\dagger\dagger}p \le .01$ .  ${}^{\dagger\dagger\dagger}p \le .001$ .
	Regression models to predict AAC satisfaction				
Predictors	Combination <sup>†††</sup>	Interaction <sup>†††</sup>	Final <sup>+++</sup>		
Paradigms:					
Closed PA	37 <sup>†</sup> (29)	-6.93 (-5.50)	47 <sup>†</sup> (37)		
Closed BD	17 (16)				
Random BD	.42 <sup>†</sup> (.27)	-5.47 (-3.53)	.38 <sup>†</sup> (.25)		
Random I	.62 <sup>†††</sup> (.44)	-3.35 (-2.38)	.65 <sup>†††</sup> (.46)		
Closed PA* Random BD		1.58 (5.95)			
Closed PA* Random I		1.15 (5.21)			
Random BD* Random I		1.05 (4.55)			
Closed PA* Random BD* Random I		29 (-5.99)			
Intercept	1.40	24.95	1.21		
R <sup>2</sup>	.52	.53	.50		
Adjusted R <sup>2</sup>	.46	.44	.46		

Table 20. Summary of multiple regression analysis to predict AAC satisfaction as a function of family paradigm, Combining significant main effects in final model

Note. Unstandardized regression coefficients are reported for predictor variables with standardized coefficients shown in parentheses underneath the unstandardized regression coefficient.  ${}^{\dagger}p \le .05$ .  ${}^{\dagger\dagger}p \le .01$ .  ${}^{\dagger\dagger\dagger}p \le .001$ .

Elements	Paradigm	Before- Diagnosis	After- Diagnosis	Post- AAC	Ideal
		M CI <sup>a</sup>	M CI <sup>a</sup>	M CI <sup>a</sup>	M CI <sup>a</sup>
Resources	Closed Random Open Synchronous	3.5 ±.32 4.2 ±.29 4.5 ±.23 2.8 ±.43	$\begin{array}{rrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrr$	3.6 ±.29 4.1 ±.26 4.6 ±.28 2.2 ±.40	3.0 ±.34 4.8 ±.13 4.6 ±.22 2.5 ±.34
Time	Closed Random Open Synchronous	$3.3 \pm .48$ $3.8 \pm .48$ $4.2 \pm .37$ $2.6 \pm .53$	4.4 ±.33 2.6 ±.47 3.9 ±.46 2.1 ±.47	$\begin{array}{rrrr} 4.2 & \pm .32 \\ 3.2 & \pm .40 \\ \textbf{4.4} & \pm .31 \\ 2.1 & \pm .46 \end{array}$	4.1 ±.35 4.3 ±.31 4.8 ±.13 2.1 ±.50
Space	Closed Random Open Synchronous	2.5 $\pm$ .52 4.1 $\pm$ .36 4.0 $\pm$ .44 2.2 $\pm$ .48	2.7 ±.50 3.9 ±.37 4.3 ±.39 2.0 ±.52	2.4 ±.50 4.1 ±.38 4.0 ±.44 1.8 ±.52	1.9 ±.50 4.8 ±.20 4.1 ±.36 2.0 ±.52
Energy	Closed Random Open Synchronous	$\begin{array}{rrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrr$	$\begin{array}{rrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrr$	3.8 ±.39 3.9 ±.38 4.5 ±.31 2.6 ±.44	3.7 ±.40 4.4 ±.30 4.8 ±.13 3.7 ±.40
Material	Closed Random Open Synchronous	$\begin{array}{rrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrr$	2.6 ±.55 4.4 ±.38 4.0 ±.44 2.1 ±.46	2.9 ±.52 4.5 ±.32 4.2 ±.36 2.2 ±.49	2.5 ±.48 4.9 ±.08 3.7 ±.40 2.1 ±.51
Goals	Closed Random Open Sumebronous	$3.9 \pm .32 \\ 4.3 \pm .25 \\ 3.9 \pm .37 \\ 3.2 \pm .37$	3.9 ±.40 3.9 ±.34 3.9 ±.43 3.3 ±.42	$3.9 \pm .32 \\ 3.8 \pm .33 \\ 4.1 \pm .39 \\ 3.5 \pm .41$	4.1 ±.27 3.6 ±.33 4.8 ±.15 2.8 ± 42
Control	Closed Random Open Synchronous	$3.1 \pm .50$ $3.6 \pm .44$ $3.1 \pm .48$ $3.8 \pm .44$	$\begin{array}{rrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrr$	$\begin{array}{rrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrr$	$\begin{array}{rrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrr$
Affect	Closed Random Open Synchronous	3.4 ±.47 3.9 ±.40 3.7 ±.39 2.2 ±.52	<b>3.6</b> ±.50 3.1 ±.52 3.5 ±.45 2.9 ±.57	<b>3.6</b> ±.47 3.6 ±.47 3.6 ±.45 2.7 ±.52	3.4 ±.44 4.6 ±.26 4.2 ±.34 2.3 ±.54
Meaning	Closed Random Open Synchronous	4.2 ±.34 3.8 ±.44 2.9 ±.46 3.5 ±.40	4.6 ±.29 2.9 ±.50 3.3 ±.54 3.0 ±.49	<b>4.3</b> ±.26 3.3 ±.38 3.7 ±.42 3.5 ±.43	4.4 ±.32 3.9 ±.38 4.2 ±.27 3.9 ±.42
Content	Closed Random Open Synchronous	$3.7 \pm .42$ $3.6 \pm .51$ $4.0 \pm .39$ $2.5 \pm .48$	3.2 ±.49 3.7 ±.39 4.2 ±.42 2.4 ±.50	$\begin{array}{rrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrr$	3.7 ±.36 2.7 ±.48 4.9 ±.16 2.2 ±.46

Table 21. Average paradigm cluster score by element across judgments

<sup>a</sup> Note. Confidence interval (CI) is based on a 95% two-sided level. Bolding within each element indicates the highest average cluster score for that judgment (based on output data with 2 decimal points).



Figure 1. Basic processing of inputs and creation of outputs by a family system (Based on Bubolz & Sontag, 1993; Imig, 2000a; Villarruel et al., 1995)



Figure 2. Changes in family paradigms across the 4 judgments (N=42 families).[MJCH1]

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# **APPENDIX B**

Case History

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Date

ID

## **Case History**

Thank you for your participation.

Please answer the questions below. "Child" refers to your preschool child who is using augmentative and alternative communication (AAC). AAC is the way that your child communicates (other than with natural speech or gestures). AAC includes sign language, communication pictures, communication boards, communication books, and voice output devices.

#### AAC user

1) When is your child's birthday? Please write as mm/dd/yyyy. For example: 04/12/1999

2) What is your child's gender?

\_\_\_\_Female

\_\_\_\_Male

3) What is your child's racial/ethnic background? *Please select all that apply.* 

American Indian/Alaskan Native

\_\_\_\_Asian

Native Hawaiian or Other Pacific Islander

Black/African American

\_\_\_Caucasian/White

\_\_\_\_Hispanic/Latino

\_\_\_Prefer not to answer

Other (specify in Question 4)

4) If you checked Other in Question 3, please specify.\_\_\_\_\_

5) Please indicate all of your child's diagnoses.

Please select all that apply.

\_\_\_Apraxia

Autism/Pervasive developmental disorder (PDD)

\_\_\_Cerebral palsy

\_\_\_\_Developmental delay

Dual sensory impairment (Deaf-blind)

\_\_\_\_Dysarthria

Hearing impairment-temporary such as with ear infections

Hearing impairment-permanent

Medically fragile

\_\_\_\_Mental retardation

\_\_\_\_Seizure disorder

\_\_\_\_Traumatic brain injury

Visual impairment not corrected by glasses

\_\_\_Cause unknown

Other (please specify in Question 6)

6) If you checked Other in Question 5, please specify.\_\_\_\_\_



- 7) How would you rate the severity of your child's disabilities as they affect your family's daily activities?
- \_\_\_\_Mild
- \_\_\_Moderate
- \_\_\_\_Severe
- 8) How old was your child when you first suspected that he or she had a communication disorder? Less than 1 year old
- \_\_\_\_1 year through 1 year, 11 months
- \_\_\_\_2 years through 2 years, 11 months
- \_\_\_\_3 years through 3 years, 11 months
- \_\_\_\_4 years through 4 years, 11 months
- \_\_\_\_5 years through 5 years, 11 months
- \_\_\_\_6 years through 6 years, 11 months
- 9) How old was your child when he or she was diagnosed with a communication disorder?
- \_\_\_\_Less than 1 year old
- \_\_\_\_1 year through 1 year, 11 months
- \_\_\_\_2 years through 2 years, 11 months
- \_\_\_\_3 years through 3 years, 11 months
- \_\_\_\_4 years through 4 years, 11 months
- 5 years through 5 years, 11 months
- \_\_\_\_6 years through 6 years, 11 months
- 10) Who made this diagnosis (e.g., speech-language pathologist, family physician, teacher, neurologist)?
- 11) How old was your child when he or she first received an AAC system (i.e., some way for your child to communicate other than with your child's natural speech or gestures)?
- \_\_\_Less than 1 year old
- \_\_\_\_1 year through 1 year, 11 months
- \_\_\_\_2 years through 2 years, 11 months
- \_\_\_\_3 years through 3 years, 11 months
- 4 years through 4 years, 11 months
- \_\_\_\_5 years through 5 years, 11 months
- \_\_\_\_6 years through 6 years, 11 months

12) How satisfied were you with this first AAC system?

- \_\_\_\_Strongly satisfied
- \_\_\_Satisfied
- \_\_\_Neutral
- \_\_\_\_Dissatisfied
- \_\_\_\_Strongly dissatisfied
- \_\_\_\_Did not have access to it at home
- 13) How old was your child when he or she received the most recent AAC system (i.e., some way for your child to communicate other than with your child's natural speech or gestures)?
  - \_\_Still using only the first AAC system (Skip to Question 15)
- \_\_\_Less than 1 year old
- \_\_\_\_l year through 1 year, 11 months
- \_\_\_\_2 years through 2 years, 11 months
- \_\_\_\_3 years through 3 years, 11 months
- \_\_\_\_4 years through 4 years, 11 months
- \_\_\_\_5 years through 5 years, 11 months
- \_\_\_\_6 years through 6 years, 11 months

- 14) How satisfied are you with the current AAC system?
- \_\_\_\_Strongly satisfied
- \_\_\_\_Satisfied

Neutral

\_\_\_\_Dissatisfied

\_\_\_\_Strongly dissatisfied

Do not have access to it at home

15) What types of AAC components are available for your child to use at home, at school, and/or in the community?

Please select all that apply.

\_\_Sign language

Communication pictures/boards

- \_\_\_\_Communication books
- \_\_\_\_Simple voice output device (limited to one page of messages and one button equals one word, phrase, or sentence.)
- Complex voice output device (permits multiple pages or screens and/or the same buttons can be combined to create different words-semantic compaction.)

\_\_\_Other (please describe in Question 16.)

- 16) Please describe other type(s) of AAC components if you checked **Other** in Question 15.
- 17) How often does your child VOCALIZE (uses voice that doesn't sound like words) to communicate at home?

\_\_\_Never

Rarely

\_\_\_Sometimes

\_\_\_Often

\_\_\_\_Always

- 18) How often does your child use SPEECH or SPEECH APPROXIMATIONS (uses voice that does sound like words) to communicate at home?
- \_\_\_Never
- \_\_\_Rarely
- \_\_\_\_Sometimes

\_\_\_Often

\_\_\_\_Always

19) How often does your child communicate by POINTING or GESTURING at home?

\_\_\_Never

\_\_\_\_Rarely

\_\_\_\_Sometimes

Often

\_\_\_\_Always

20) How often does your child use SIGN LANGUAGE to communicate at home?

\_\_\_Never

\_\_\_\_Rarely

Sometimes

\_\_\_Often

\_\_\_\_Always

21) How often does your child use COMMUNICATION PICTURES (single pictures) or BOARDS (single page of pictures) to communicate at home?

Never

Rarely

\_\_\_\_Sometimes

\_\_\_Often

\_\_\_Always

22) How often does your child use COMMUNICATION BOOKS (multiple pages) to communicate at home?

\_\_\_Never

\_\_\_Rarely

\_\_\_\_Sometimes

- \_\_\_Often
- \_\_\_\_Always
- 23) How often does your child use a SIMPLE VOICE OUTPUT DEVICE (limited to one page of messages and one button equals one word, phrase, or sentence) to communicate at home? Never
- Rarely
- Sometimes

Often

- Always
- 24) How often does your child use a COMPLEX VOICE OUTPUT DEVICE (permits more than one page or screen of messages and/or the same buttons can be combined to create different words semantic compaction) to communicate at home?
  - \_\_Never
- \_\_\_Rarely
- \_\_\_\_Sometimes
- \_\_\_Often
- \_\_\_\_Always
- 25) Please list any other ways your child communicates at home and the frequency with which your child uses them (rarely, sometimes, often, always).
- 26) If you know the brand names of your child's AAC components, please list them.

If your child has communication pictures, communication board, communication book, and/or voice output device, please continue with Question 29.

If your child does **NOT** have communication pictures, communication board, communication book, and/or voice output device, please answer Question 27 and then skip to Question 35.

27) Why doesn't your child use communication pictures, communication boards, communication books, and/or voice output devices?

Please select all that apply.

\_\_\_Child talks/signs/gestures

- Child not ready and/or working on skills
- \_\_\_\_Can't afford AAC or AAC not available
- \_\_\_\_Child quit using
- \_\_\_\_AAC ordered/Waiting for delivery
- \_\_\_\_AAC is broken/Waiting for repairs

\_\_\_Not told

\_\_\_\_Don't know why

\_\_\_Other (please describe in Question 28)

- 28) If you checked Other in Question 27, please describe.
- 29) If your child uses communication pictures, communication boards, communication books, and/or voice output devices, please describe the pictures/symbols.

Please select all that apply.

- \_\_\_Printed words
- Black and white line drawings
- \_\_\_Color line drawings
- \_\_\_Color photographs
- \_\_\_Black and white photographs
- \_\_\_\_Raised or textured symbols (e.g., sandpaper, cloth, glue-gun outlined)
- Parts of actual objects
- \_\_\_\_Full-sized actual objects
- <u>Miniature objects</u>

30) How does your child select messages from his or her AAC system?

Please select all that apply.

\_\_Points or touches pictures with finger or other body part

- \_\_Looks at the picture (eye gaze)
- \_\_\_\_Uses a joystick
- \_\_\_Uses 1 switch
- \_\_\_\_Uses 2 or more switches
- \_\_\_\_Uses optical pointer, light beam, or head mouse
- \_\_\_\_Uses head stick or chin stick
- \_\_\_\_Uses standard keyboard

\_\_\_Uses alternate keyboard (addition to or replacement for a standard keyboard)

\_\_\_\_Uses touch screen

\_\_\_Uses encoding

- \_\_\_Other (please describe in Question 31)
- 31) Please describe any other ways that your child selects messages.
- 32) What body part or parts does your child use to point to or activate the AAC system (e.g., finger, hand,

toe, eye blink, eye gaze, head turn)?

- 33) How was the AAC system funded? Please select all that apply.
  - By the school or other educational agency
- By a non-profit organization
- By health insurance
- By Medicaid or Medicare
- By our family
- By community fundraisers
- Other (Please describe in Question 34)
- 34) If you checked Other in Question 33, please describe.
- 35) What is your child's educational setting? *Please select all that apply.*

Home visits by early intervention professionals

Self-contained preschool (all kids have disabilities)

- Integrated preschool (at least 50% of kids have no disabilities)
- None

Unsure

Other (please specify in Question 36)

- 36) If you checked Other in Question 35, please describe.
- 37) Has your child and/or any other family member received assistance in learning to use the AAC system?

Please select all that apply.

No (Please continue with Question 41)

\_\_\_Yes, at home

\_\_\_Yes, at preschool

Yes, other (please describe in Question 38.)

38) If you checked Other in Question 37, please describe.

#### 39) What type of AAC assistance has been received? Please select all that apply.

Learning how to:

\_\_\_\_Maintain and/or troubleshoot the AAC system

Program or create new communicative messages

\_\_\_\_Use AAC to communicate in daily activities

- \_\_\_\_Access messages (learning to use switches, scanning, joystick, picture pointing, etc.)
- \_\_\_\_Other (please describe in Question 40)
- 40) If you checked Other in Question 39, please describe.
- 41) Please describe your child's overall language skills with or without AAC.
  - Please select all that apply.
  - \_Follows requests and directions without assistance
- \_\_\_\_Makes requests spontaneously
- \_\_\_\_Responds to comments appropriately
- \_\_\_\_Makes comments spontaneously
- \_\_\_\_Answers questions appropriately
- Asks questions spontaneously
- \_\_\_Responds to communication by others but does not initiate communication
- \_\_\_\_Does not spontaneously communicate
- 42) How many words or messages does your child produce independently through speech, sign, and/or AAC?

\_\_None

Few (approximately 1-9)

\_\_\_Several (approximately 10-50)

\_\_\_Many (more than 50)

43) How does your child communicate using AAC, his or her own speech, and gestures? *Please select all that apply.* 

\_\_\_\_Uses single words

\_\_\_\_Uses two-word utterances (e.g., more milk, no go, Mommy car)

\_\_\_\_Uses three-word or longer utterances (e.g., Dog ran fast, Not on box)

\_\_\_Constructs grammatically correct sentences (e.g., I am playing with the ball.)

\_\_\_\_Does not communicate in any of these ways

44) In an average week, approximately how many hours does someone read to your child at home?

45) In an average week, approximately how many hours does your child draw, scribble, color, or write at home? (This could be done with pencils, crayons, computer programs, or other adaptations if needed.)

### Family

46) What is the primary language spoken at home? Please select all that apply. English Spanish Other (Please list in Question 47) 47) If you checked Other in Question 46, please describe. 48) Please list the gender and age of any other children in your family (even if they live with you only part of the time): Please put each child on a new line. (For example, "male, 2" would indicate a 2 year-old brother. "female, 12" "male, 8" "female, 1" would indicate that your child has a 12 year-old and 1 year-old sister as well as an 8 year-old brother.) 49) How many children with disabilities are in your family (including the AAC user)? 50) How many adults live in your house full-time (including yourself)? 51) Where do you live? Farm Rural but not a farm Town (population up to 49,999) which is not part of a metro area Small city (population of 50,000 to 99,999) Medium city (population of 100,000 to 299,999) Large city (population over 300,000) 52) What is your zip code? 53) What is your family's combined total gross (before taxes) yearly household income? Under \$10,000 \$10,000 - \$19,999 \$20,000 - \$39,999 \$40,000 - \$59,999 \$60,000 - \$99,999 \$100,000 - \$149,999 Over \$150,000 Prefer not to answer **Primary Caregiver** NOTE: The term "primary caregiver" refers to the adult who spends the most time communicating with the

child and/or who has more child care and home responsibilities.
54) Are you the primary caregiver?
Yes
No
55) What is the primary caregiver's age?
56) What is the primary caregiver's gender?

Female

Male

57) What is the primary caregiver's relationship to the child?

**Biological parent** 

Foster parent

\_\_\_Step-parent

\_\_\_Legal guardian

\_\_\_Adoptive parent

\_\_\_Other (please specify in Question 58)

58) If you checked Other, please specify the relationship to the child.

59) What is the educational level of the primary caregiver?

Grade school only

\_\_Some high school

\_\_\_High school graduate

\_\_\_\_Some college

\_\_\_College graduate

\_\_\_\_Some graduate school

\_\_\_\_Advanced degree

60) What is the primary caregiver's marital status?

\_\_\_\_Single

\_\_\_Married (to child's other parent)

\_\_\_\_Married (but not to child's other parent)

\_\_\_Separated or divorced

\_\_\_\_Widowed

- Other (please explain in Question 61)
- 61) If you checked Other in Question 60, please describe.

62) Please describe the occupational status of the primary caregiver.

Please select all that apply.

\_\_\_Business owner

- \_\_\_\_Full-time employee
- Part-time employee
- \_\_\_\_Stay-at-home caregiver

\_\_\_Student Retiree

Other (please specify in Question 63)

63) If you checked Other, please describe the occupational status.

- 64) What is the occupation of the primary caregiver (e.g., clerk, teacher, salesperson, stay-at-home caregiver)?
- 65) Where does the primary caregiver work (e.g., discount store, high school, home-based business)?
- 66) What is the primary caregiver's racial/ethnic background? *Please select all that apply.* American Indian/Alaskan Native

Asian

Native Hawaiian or Other Pacific Islander

Black/African American

\_\_\_\_Caucasian/White

Hispanic/Latino

Prefer not to answer

\_\_\_\_Other (specify in Question 67)

67) If you checked Other in Question 66, please specify.

#### Secondary Caregiver

NOTE: The term "secondary caregiver" refers to another adult who shares in child rearing responsibilities.

- 68) Is there a secondary caregiver?
- <u>Yes (If yes, please continue with Question 69.)</u> No (If **no**, you are **finished with this case history questionnaire.**)
- 69) What is the secondary caregiver's age?
- 70) What is the secondary caregiver's gender?

\_\_\_Female

\_\_\_Male

- 71) What is the secondary caregiver's relationship to the child?
- \_\_\_Biological parent
- \_\_\_Foster parent
- \_\_\_Step-parent
- \_\_\_\_Legal guardian
- \_\_\_\_Adoptive parent
- \_\_\_Other (please specify in Question 72)
- 72) If you checked Other, please specify the relationship to the child.
- 73) What is the educational level of the secondary caregiver?
- Grade school only
- \_\_\_\_Some high school
- \_\_\_\_High school graduate
- \_\_\_\_Some college
- \_\_\_College graduate
- \_\_\_\_Some graduate school
- \_\_\_\_Advanced degree
- 74) What is the secondary caregiver's marital status?
- \_\_\_\_Single
- \_\_\_\_Married (to child's other parent)
- \_\_\_\_Married (but not to child's other parent)
- \_\_\_\_Separated or divorced
- \_\_\_\_Widowed
- \_\_\_Other (please explain in Question 75)
- 75) If you checked Other in Question 74, please describe.
- 76) Please describe the occupational status of the secondary caregiver. Please select all that apply.
- Business owner
- \_\_\_\_Full-time employee
- \_\_\_\_Part-time employee
- \_\_\_\_Stay-at-home caregiver
- \_\_\_\_Student
- \_\_\_\_Retiree
- \_\_\_Other (please specify in Question 77)

- 77) If you checked Other, please describe the occupational status.
- 78) What is the occupation of the secondary caregiver (e.g., clerk, teacher, salesperson, stay-at-home caregiver)?
- 79) Where does the secondary caregiver work (e.g., discount store, high school, home-based business)?
- 80) What is the secondary caregiver's racial/ethnic background? *Please select all that apply.* \_\_\_\_American Indian/Alaskan Native

\_\_\_\_Asian

- Native Hawaiian or Other Pacific Islander
- Black/African American
- \_\_\_\_Caucasian/White
- \_\_\_\_Hispanic/Latino
- Prefer not to answer
- \_\_\_Other (specify in Question 81)

81) If you checked Other in Question 80, please specify.

# **APPENDIX C**

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AAC Family - Paradigm Assessment Scale (AACF-PAS)

## AAC Family - Paradigm Assessment Scale (AACF-PAS)

The purpose of this questionnaire is to assess your perception of how your family functions. Instructions:

Column 1 labeled C: Complete the questions on the following screens by assigning a value of 10 to the ONE choice (A, B, C, D) in the C column which most accurately describes your CURRENT (C) understanding of your family. From the three remaining choices in the C column assign a value ranging from 0-9 to the 2nd most descriptive choice. 0 indicates that this is NOT how your family functions. As the number increases, the characteristic comes closer to how the family operates. Repeat for the 3rd and 4th choices. All values (0-9), except for the number 10 may be repeated any number of times. Remember, that there must be and should be only one 10 in the C column (see Sample Question below).

**Column 2 labeled I**: Family life is not always what we would like for it to be. Please repeat the process as described above for the column marked I. Assign a value of 10 to the ONE choice (A, B, C, D) that most **IDEALLY (I)** represents how you would like for this aspect of your family to be. As before, assign values to the three remaining choices. All values except for 10 may be repeated any number of times.

Column 3 labeled B: Now, think back to the time **BEFORE** (B) you were aware that your child had a communication disorder. Please rate how your family functioned. Again, assign a 10 to the choice that most closely represented your family. Then, assign values from 0-9 to the other 3 choices.

Column 4 labeled A: Now, think back to the time IMMEDIATELY AFTER (A) your child was diagnosed with a communication disorder. Please rate how your family functioned. Below is an example question with the numbers filled in. Again, note that there is one 10 per column, but not more than one 10 per column. **EXAMPLE** 

In our family we generally tend to communicate with	1		Thin	k back
each other in the following way.	C	I	В	Α
A - In a direct and factual manner	10	6	10	2
B - In a tactful and less direct manner	4	8	8	6
C - In a questioning and engaging manner	8	2	1	6
D - In a humorous and understanding manner	4	10	2	10

Relationships also involve behavior. The four types of behaviors are described below.

Initiating-Moving: In any relationship someone or something starts, initiates, causes or determines what will take place and when.

Questioning-Challenging: In your relationship you or your partner may comment on the action taking place and have a range of suggestions for how things might be changed for a variety of reasons.

**Reflecting-Commenting:** Sometimes someone doesn't initiate, challenge or support any actions taken, but insteads acts as a kind of guide and conscience by providing a balanced, accurate and nonblaming sense of reality, insight and wisdom about what they have observed.

Agreeing-Supporting: Finally, someone may agree with or confirm the behaviors of one, any or all of the other behaviors (initiating - moving, questionning - challenging, or reflecting - commenting).

Following the same instructions provided above, please assign CURRENT (C), IDEAL (I), BEFORE (B), and IMMEDIATELY AFTER (A) your child's communication disorder diagnosed values. Please see the examples below. **EXAMPLE** 

What behaviors describe how ye communication in your family?	What behaviors describe how you contribute to communication in your family?			
	С		В	A
Initiating-Moving	10	6	4	10
Ouestioning-Challenging	6	10	5	8
Agreeing.Supporting	4	4	10	6
Reflecting-Commenting	2	8	9	4

1. In your family, how do the important things that must get done, get done?	с	I	Think back B A	
A - We just know what needs to get done & how to do it				
B - By being well organized, using successful & structured routines, and perhaps most importantly having a plan we can count on				
C - Each person does what they think needs to get done and how to do it				
D - By regularly discussing and agreeing with each other what needs to get done and how "best" to work together to get things done				

What behaviors do you play in what has to get done?	What behaviors do you play in contributing to getting done what has to get done?			ack
	С	1	В	A
Initiating-Moving				
Questioning-Challenging				, · · · · · · · · · · · · · · · ·
Agreeing-Supporting				
Reflecting-Commenting				

2. How do you show your affection, care & support for one another?		I	Think B	A back
A - We share our love & affection for each other in an intimate, expressive, emotionally shared and somewhat private manner				
B - We demonstrate our love & affection for one another in a somewhat conventional, regulated, modest and always private manner				
C - We show our love & affection for each other in a playful, spontaneous, uninhibited and sometimes public manner				
D - We share our affection in an unspoken manner - because we just know without saying it that we deeply love & care for each other				

What behaviors do you use who caring in your family?	en showing affec	tion &	Think back	
	С	1	В	Α
Initiating-Moving				
Questioning-Challenging				
Agreeing-Supporting				
Reflecting-Commenting				

3. Within your family, what contributes to providing you with a sense of purpose and meaning?	С	I	Think B	back A
A - By each of us having the freedom & autonomy to engage in a personal journey of growth, exploration & self-discovery				
B - By valuing the family more than ourselves as individuals, making decisions that benefit our common good, and valuing the virtues of organization, discipline & responsibility				
C - When our personally unique experiences & insights result in a shared, implicit & unspoken sense of unity, harmony & way of knowing				
D - By working together in our family to "go beyond" what has always been to create new and different ways of living life				

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What behaviors do you play in de meaningful and has purpose?	etermining what	it is	Think back	
· · · · ·	С	1	В	Α
Initiating-Moving				
Questioning-Challenging				
Agreeing-Supporting				
Reflecting-Commenting				······

4. How in your family do you go about "making			Think	back
sense" out of what you experience in life ?	C	<b>I</b>	В	<u> </u>
A - By sharing our ideas with each other, by asking each other questions, and listening to the opinions & thoughts of others				
B - Each of us subjectively relies on ourselves and our own ideas to personally make sense out of what it is we experience in life				
C - By using "the" time-tested & established rules & truths of life, and by having learned how to look at any situation in an objective and factual manner				
D - We just seem to know without much discussion how to understand and make sense out of what we experience in life				

What behaviors do you play when trying to make sense out of life experience?			Think ba	
	C	1	В	A
Initiating-Moving				
Questioning-Challenging				<b></b>
Agreeing-Supporting				
Reflecting-Commenting				

5. From a relational point-of-view, what emphasis do			Think back		
you feel is being placed on the following areas?	C	1	В	A	
A - The importance of our being able to understand & make sense out of our life experiences in an accurate & realistic way					
B - That our family is guided by a greater sense of purpose and meaning in life					
C - That in our family we provide each other with the amount & kind of affection, caring, love & support wanted & needed					
D - That the important & necessary things that need to get done in order to have a quality family - get done					

What behaviors do you play in determining the importance of these areas?			Think	back
	С	1	В	A
Initiating-Moving				
Questioning-Challenging				
Agreeing-Supporting				
Reflecting-Commenting				

6. In your family, how is time generally used?			Think	back
	C	1	В	Α
A - In a flexible & adaptive manner - it can be changed as needed				
B - In a planned, scheduled & organized manner				
C - In a spontaneous manner so that opportunities for unplanned, interesting & creative experiences can happen				
D - Without hardly any discussion, in our family we just seem to know how time is to be used				

What behaviors do you play in determining how time will be used in your family?			Think	back
	C	I	В	Α
Initiating-Moving				
Questioning-Challenging				
Agreeing-Supporting				
Reflecting-Commenting				

7. In your family, how are questions and ideas handled?	с	I	Thini B	k back A
A - In our family we can ask any questions. We can say anything to each other, no matter how personally intimate, confronting or just plain silly. Its OK to ask any questions - no matter what!			<u> </u>	
B - Certain issues and topics are rarely discussed in our family because they are inappropriate. Discussions are usually constructive & conducted with mutual respect				
C - Within reason, most questions can be asked and ideas can be discussed - but differences causing conflict are to be resolved				
D - There doesn't seem to be any real need for us to ask questions of each other, we just seem to understand most things in the same way				

What behaviors do you play in determining how ideas & questions will be handled?			Think	back
	С	1	В	A
Initiating-Moving				
Questioning-Challenging				
Agreeing-Supporting				
Reflecting-Commenting				

8. How is energy and effort used in your family?	<b>y</b> ?		Think back		
	С	1	В	Α	
A - In a steady, consistent, regulated and controlled manner					
B - In a dynamic, enthusiastic, spirited and vigorous manner					
C - In an peaceful, calm, serene and tranquil manner					
D - In a flexible, adaptive, changeable & accommodating manner					

What behaviors do you play in determining how effort & energy will be used?			Think	back
	С	I	В	Α
Initiating-Moving				
Questioning-Challenging				
Agreeing-Supporting				
Reflecting-Commenting				

9. In your family, how do you relate to your possessions and belongings - the "things" of life?	с	I	Think B	k back A
A - "Things" are valued because we worked hard to get them, and for us they represent the "just" & deserving rewards of life				
B - "Things" aren't what's really important in life - it's experiencing & living life that's important - things often just get in our way				
C - "Things" are useful in life because we can use them to get other more important things done & to make life more convenient				
D - "Things" are to be valued and respected because of the personal meaning that they represent. Because of their importance they should be protected & kept as perfect as possible				

What behaviors do you play in depossessions and belongings?	Think back			
	С	1	В	A
Initiating-Moving				
Questioning-Challenging				· · · · · · · · · · · · · · · · · · ·
Agreeing-Supporting				
Reflecting-Commenting				

10. What emphasis is placed in your family on the following areas?	С	1	Thinl B	k back A
A - The importance of possessions and belongings				
B - The importance of effort & energy in our family				
C - The importance of time & how it will be used				
D - The importance of ideas, questions & information				

What behaviors do you play in determining the comparative importance of these areas?			Think	back
	С	1	В	A
Initiating-Moving				
Questioning-Challenging				
Agreeing-Supporting				
Reflecting-Commenting				

Please check that each column has one and **only** one 10 in it. Thank you for participating!

# **APPENDIX D**

AACF-PAS Calculations

_		Goals			Resources
Question		Paradigm		stion	Paradigm
1		Control	6		Time
1	Α	Synchronous	6	Α	Open
1	В	Closed	6	В	Closed
1	С	Random	6	С	Random
1	D	Open	6	D	Synchronous
2		Affect	7		Space
2	Α	Open	7	Α	Random
2	В	Closed	7	В	Closed
2	С	Random	7	С	Open
2	D	Synchronous	7	D	Synchronous
3		Meaning	8		Energy
3	Α	Random	8	Α	Closed
3	В	Closed	8	В	Random
3	С	Synchronous	8	С	Synchronous
3	D	Open	8	D	Open
4		Content	9		Material
4	Α	Open	9	Α	Closed
4	в	Random	9	В	Random
4	С	Closed	9	С	Open
4	D	Synchronous	9	D	Synchronous
5		Goals	10		Resources
5	Α	Content	10	Α	Material
5	В	Meaning	10	В	Energy
5	С	Affect	10	С	Time
5	D	Control	10	D	Space

AACF-PAS Calculations

The table above shows which AACF-PAS questions capture different elements and paradigms. Each question in each section (e.g., 1A, 1B, 1C, 1D in the control section) is given a rating ranging from 0 to 10. These four raw scores are totalled.

A simple coefficient for an element's paradigm is calculated by dividing the raw score for that element by the total of the four raw scores for that element. (For example, to calculate the simple coefficient for synchronous control, the raw score for 1A is divided by the sum of 1A, 1B, 1C, and 1D. To calculate the simple coefficient for closed control, the raw score for 1B is divided by the sum of 1A, 1B, 1C, and 1D.) This procedure is repeated to calculate a simple coefficient for each paradigm of the eight elements as well as for the goals (question 5) and the resources (question 10).

A complex coefficient for an element's paradigm is calculated by multiplying its simple coefficient by the appropriate goal or resource simple coefficient. [For example, to calculate the complex coefficient for synchronous control, the simple coefficient for synchronous control is multiplied by its appropriate simple goal coefficient for control (5D/(sum(5A, 5B, 5C, 5D))). To calculate the simple coefficient for closed material, the simple coefficient for closed material is multiplied by its appropriate simple resource coefficient for material (10A/(sum(10A, 10B, 10C, 10D)))]. This is completed for all 32 of the paradigm elements (i.e., 4 paradigms by 8 elements.) The resulting 32 complex coefficients for the individual elements are then ranked from highest to lowest in order to create quartile scores.

To determine cluster scores for individual elements, a *complex cluster coefficient* is calculated by dividing the complex coefficient for a paradigm element by the maximum complex coefficient for that element. Then a cluster score is assigned based on the cluster complex coefficient: 1 to .9 = 5; .89 to .7 = 4; .69 to .4 = 3; .39 to .2 = 2; .19 to .10 = 1; and < .1 = 0. [For example, assume the complex coefficients for closed, random, open, and synchronous material are .035, .042, .057, and .071. In this example, the maximum complex coefficient for that element is .071 synchronous material. Thus, to calculate the complex cluster coefficient for closed material, its complex coefficient (.035) is divided by the maximum complex coefficient (.071), resulting in a cluster coefficient (.49). The cluster score of 2 is then assigned for closed material.]

**To determine cluster scores for goals,** each of the complex cluster coefficients for the 4 paradigms for the goal elements are summed and then divided by the paradigm with the highest sum. Then cluster scores are assigned based on the cluster complex coefficients: 1 to .9 = 5; .89 to .7 = 4; .69 to .4 = 3; .39 to .2 = 2; .19 to .10 = 1; and < .1 = 0. [For example, each paradigm's four goal complex coefficients will be summed (first, the closed goal sum of closed control, closed affect, closed meaning, and closed content; then the random goal sum of random control, random affect, random meaning, and random content; then the open goal sum of open control, open affect, open meaning, open content; and finally the synchronous goal sum of synchronous control, synchronous affect, synchronous meaning, synchronous content). To calculate a cluster score for open goals, the sum (.256) of open control, open affect, in this case, .298 synchronous goal) resulting in a cluster complex coefficient (.86). The cluster score of 4 is then assigned for open goal.]. **Resources cluster scores** are determined in a similar way by replacing the goal elements with the resource elements.

To determine overall cluster scores, an overall complex cluster coefficient must be calculated. All 8 of the complex coefficients for a paradigm are summed (e.g., closed control, closed affect, closed meaning, closed content, closed time, closed space, closed energy, and closed material). Each sum is divided by whichever sum (i.e., closed, open, random, or synchronous) of the 8 complex coefficients is highest. Then the overall cluster score is assigned based on the cluster complex coefficient: 1 to .9 = 5; .89 to .7 = 4; .69 to .4 = 3; .39 to .2 = 2; .19 to .10 = 1; and < .1 = 0.

## **APPENDIX E**

Rules to Correct Raw AACF-PAS Scores

## Rules to Correct Raw AACF-PAS Scores

Note: These were used only for the paper version since the computer version required that numbers be completed correctly:

- 1) If a column does not contain a 10, take the highest number and make it a 10.
- 2) If there is a tie of the highest number, randomly break the tie and make that number a 10.
- 3) If a number is missing, look for a logical pattern and then obtain inter examiner agreement. If no logical pattern, then put in 5s to go for no strong preference.
- 4) If missing a column of data, assume the null of no change.
- 5) If missing element data, look at Question 5 or Question 10, whichever is appropriate, to see if element is rated high. If the element is rated high, then the person's paradigm data cannot be used. If element is rated low, put in null data or logical data since the element will have limited impact on the rankings.

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