

Considering Response Efficiency in the Selection and Use of AAC Systems

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Abstract

Individuals with severe disabilities whose speech is either ineffective or inefficient for meeting their communicative needs have benefited from augmentative and alternative modes of communication (AAC). However, despite the evidence supporting the use of AAC with individuals with severe disabilities, practitioners may still encounter challenges in implementing AAC interventions. These challenges may be due, in part, to problems related to contextual fit. This paper (a) examines the importance of contextual fit in the design and implementation of AAC interventions, (b) explores the potential role of response efficiency for enhancing contextual fit, (c) presents a framework for examining the response efficiency of AAC interventions, and (d) provides a discussion of needed research. **Keywords:** Augmentative and Alternative Communication, AAC, Contextual Fit, Response Efficiency.

Introduction

Augmentative and Alternative Communication (AAC) refers to the use of devices or techniques that supplement or replace an individual's spoken communication skills (Mustonen, Locke, Reichle, Solbrach, & Lindgren, 1991). AAC includes unaided modes of communication (e.g., gestures, sign languages/systems, and facial expressions) as well as aided modes of communication (e.g., line drawings on a communication board, written words on a pad of paper, laptop computers with synthesized speech output, dedicated AAC devices with digitized speech output).

Individuals with severe disabilities whose speech is either ineffective or inefficient for meeting their communicative needs have benefited from augmentative and alternative modes of communication (e.g., Cafiero, 1998; Johnston, McDonnell, Nelson, & Magnavito, 2003; Johnston, Nelson, Evans, Palazolo, 2003; Marcus, Garfinkle, & Wolery, 2001; Miranda & Ericson, 2000; Quill, 1997; Rowland & Schweigart, 2000; Schopler, Mesibov, Shigley, & Hearsey, 1995). However, as promising as the evidence supporting the use of AAC with individuals with severe disabilities has been, practitioners still encounter challenges in implementing AAC interventions. These challenges may be due, in part, to problems related to contextual fit. This paper (a) examines the importance of contextual fit in the design and implementation of AAC interventions, (b) explores the potential role of response efficiency for enhancing contextual fit, (c) presents a framework for examining the response efficiency of AAC interventions, and (d) provides a discussion of needed research.

Importance of Contextual Fit in the Design and Implementation of AAC Interventions

The term *contextual fit* refers to the compatibility between an intervention and a variety of variables, including characteristics of the person for whom the intervention was developed, characteristics of the individuals who will implement the plan, and features of the environment within which the intervention will be implemented (Albin, Lucyshyn, Horner, & Flannery, 1996). Albin et al (1996) posit that an intervention "may be theoretically well designed and solidly grounded in both behavior theory and documented practice, and yet still not be a good fit for the people and the environments involved" (p.83). An intervention may lack strong contextual fit for a variety of reasons. For the AAC user, the AAC intervention may require too much effort and/or may not consistently result in interactions that fulfill their communication wants/needs. For communication partners, the AAC intervention may be cumbersome or

time consuming to design and implement, may conflict with existing priorities, or may fail to meet their own communicative needs.

Personal experience suggests that many AAC users and their communication partners have participated in interventions that lack a good contextual fit. For example, consider Jane, a preschool aged child who was taught to use sign language to communicate her wants and needs. Jane quickly acquired a large repertoire of signs. However, with the exception of her preschool teacher who possessed some basic knowledge of sign language, none of the peers in Jane's classroom understood or used sign language. Thus, although the use of sign language was an effective AAC strategy for Jane, the overall contextual fit of the intervention was decreased as a result of the skills/abilities of Jane's communication partners. When practitioners are faced with a situation where a beginning communicator with severe disabilities has an AAC system but uses it infrequently, or communication partners engage in infrequent interactions with the AAC user, it may be important to examine the contextual fit of the AAC intervention. One factor that may influence contextual fit relates to the efficiency of the AAC intervention compared with the efficiency of other competing behaviors.

Considering Efficiency as means of Increasing Contextual Fit

Herrnstein (1961) demonstrated that the distribution of behavior among concurrently available functionally equivalent alternatives depends on the history of reinforcement for each of the available behaviors. This led to the hypothesis that when individuals have two or more responses in a functionally equivalent class, they will select the response option that is perceived as most efficient in procuring or maintaining reinforcement (Mace & Roberts, 1993). For example, a student with severe disabilities may have learned that either biting a peer or touching a switch that produces the spoken message "I need a break" will result in release from an activity. In this example, the behavior that is most efficient (i.e., results in the greatest reinforcement for the least effort) is apt to be the more frequently used communicative act. Response efficiency is influenced by at least four variables; response effort (Bauman, Shull, & Brownstein, 1975; Beautrais & Davison, 1977; Horner, Sprague, O'Brien, & Heathfield, 1990; Horner & Day, 1991; Mace et al., 1996; Richman, Wacker, & Windborn, 2001; Skinner, Belfiore, Mace, Williams-Wilson, & Johns, 1997), rate of reinforcement (Conger & Killeen, 1974; Horner & Day, 1991; Mace, Neef, Shade & Mauro; 1994; Martens & Houk, 1989; Martens, Lochner, & Kelly; 1992; Neef, Mace, & Shade, 1993), immediacy of reinforcement (Horner & Day; 1991; Logue, 1988; Neef et al, 1993; Rachlin, 1989), and quality of reinforcement (Hollard & Davison, 1971; Mace, Neef, Shade, & Mauro; 1996; Miller, 1976; Neef & Lutz, 2001; Neef et al., 1993). McDowell (1988) hypothesized that these components interact to influence the probability that an individual will engage in one response option over another.

It seems likely that the components of response efficiency may influence a learner's use of AAC. Consider a learner who chooses to refrain from engaging in communicative interactions using his communication board comprised of black and white line drawings. This choice may be a result of the physical effort required to communicate (e.g., if the motor demands associated with retrieving the communication board and then locating symbols on the system are too great, the learner may choose not to use it). Alternatively, the learner may refrain from using the AAC system because the quality of reinforcement provided is not substantial enough to warrant its use (e.g., the learner may typically receive desired outcomes regardless of whether or not they use their system). Finally, the learner may not use their communication board because too much time lapses between the emission of the communicative behavior and the delivery of the reinforcement (e.g., communication partners do not realize the AAC user is attempting to communicate and/or have difficulty understanding the AAC user's message and therefore do not respond in a timely enough fashion to make the use of the system worthwhile).

Horner and Day (1991) implemented a series of experiments examining the role of response efficiency in teaching a communicative alternative to challenging behavior with three individuals who had severe to profound mental retardation (ranging in age from 12 to 27 years). In each experiment, participants were taught communicative alternatives that were functionally equivalent to their challenging behaviors but were not as efficient in terms of either physical effort (i.e., emitting the signs for “I want to go, please” as a replacement for escape motivated aggression), schedule of reinforcement (i.e., emitting the sign “help” three times as a replacement for emitting self-injurious behavior to obtain assistance), or latency of reinforcement (i.e., receiving a break from tasks 20 seconds after handing the interventionist a card with the word “BREAK” on it as a replacement for escape motivated aggressions). Results indicated that the new, functionally equivalent but inefficient, behaviors did not replace the challenging behaviors. However, when the alternative behaviors were made more efficient (e.g., signing “break” rather than the sentence “I want to go, please”, signing “help” only one time rather than three times, receiving a break immediately after handing the interventionist a card with the word “BREAK” on it rather than 20 seconds later), there were dramatic reductions in challenging behavior and collateral increases in the use of the new communicative alternatives.

The components of response efficiency may also influence the propensity of communication partners to engage in interactions with AAC users. This is important to consider because an AAC system is unlikely to be effective without the commitment of the AAC user’s communication partners (Brinker, Seifer, & Sameroff, 1994; Brotherson & Cook, 1996; Gallimore, Weisner, Bernheimer, Guthrie, & Nihira, 1993; Musselwhite & St.Louis, 1988). For example, consider a peer who chooses to refrain from engaging in communicative interactions with an AAC user in his class. This choice may be a result of the effort required to communicate (e.g., if the effort associated with understanding the AAC user’s communicative attempts are too great, the peer may choose to avoid interactions). Alternatively, the peer may choose to avoid interactions with the AAC user because of a low quality of reinforcement (e.g., the conversational topics that are engaged in by the AAC user may not be of interest to the peer). Finally, the peer may not engage in interactions with the AAC user because too much time lapses between the emission of the communicative behavior and the delivery of the reinforcement (e.g., the time that it takes to engage in turn-taking interactions with the AAC user is so great that the peer does not perceive the communicative interaction to be worthwhile).

In summary, it seems important to recognize the potential role of response efficiency in influencing the contextual fit of AAC interventions for AAC users and their communicative partners. The following sections will illustrate the potential role of the four components of response efficiency (response effort, rate of reinforcement, immediacy of reinforcement, and quality of reinforcement) for AAC users as well as for their communication partners. For each variable of response efficiency, the outcomes of published empirical investigations will be reported and discussed in order to demonstrate the potential influence of the components of response efficiency. In most cases, the focus of these investigations was not to directly examine the operation of the response efficiency variable being discussed. Thus, these summaries provide inferred, rather than direct, evidence of the operation of the components of response efficiency.

Response Effort

Potential influence on the AAC user. The effort required to produce a behavior can effect whether or not a learner will select that response (Bauman, Shull, & Brownstein, 1975; Beautrais & Davison, 1977). The potential influence of response effort may be applicable across a range of contexts. Typically, the influence of response effort is considered in the context of the amount of physical effort required to communicate. Horner et al. (1990) conducted an investigation in which the physical effort required for a 14 year-old learner with moderate mental retardation to request assistance using a voice-output communication aide as an alternative to engaging in challenging behavior was manipulated. In one

situation, the learner was required to emit a high effort response (typing the phrase “Help Please” on a voice output communication aid). In the second situation, the learner was required to emit a low-effort response (pressing a single key on the communication aid in order to emit the phrase, “Help please”). Outcomes revealed that the low effort response resulted in a sustained decrease in challenging behavior whereas the high effort response did not result in a sustained decrease in challenging behavior. Thus, results of this investigation demonstrate the influence of relative response effort on choice behavior when the learner has two or more behaviors that serve the same function in his repertoire.

In addition to physical effort, cognitive effort may impact the likelihood that a learner will use a particular action (Johnston, Reichle, & Evans, 2004). For example, consider a situation when a learner can either locate and point to a symbol representing “I need help” on a communication board containing 32 symbols or offer a wind-up toy to a nearby adult in order to request assistance in operating the toy. In this situation, the cognitive effort required to locate the “I need help” symbol may be more than the cognitive effort required to give the toy to the adult. As a result, pointing to the symbol may be less likely if the alternative behavior is equally likely to result in the provision of assistance.

Horn and Jones (1996) provided an example of how cognitive effort may influence a learner’s behavior. They collected data regarding the number of error responses engaged in by a four-year-old child with cerebral palsy across two selection techniques, circular scanning and direct selection with a head-mounted optical pointer. Pre-assessment data collected by the authors suggested that scanning would be the most effective technique. However, results revealed that direct selection was used more effectively as measured by response accuracy, acquisition rate, and response time to produce correct responses. The authors indicated that the error responses that occurred during the child’s use of scanning were not due to a lack of understanding of the scanning process. Rather, errors occurred as a result of off-task behaviors and inattentiveness that resulted from the inherent slowness of the scanning selection technique. These results might suggest that learner performance is influenced by the cognitive effort required to maintain attention while engaged in scanning. In addition to considering the impact of effort for an AAC user, it may be equally important to consider the impact of effort for communication partners.

Potential influence on the communication partner. A number of variables may influence the physical or cognitive effort required by communication partners who interact with AAC users and/or are involved in the design and implementation of AAC interventions. When attempting to increase efficiency from the perspective of communication partners, it is important to minimize the physical or cognitive effort for interpreting the learner’s communication via AAC as well as minimize the work involved in developing and teaching the use of the AAC system. Furthermore, if efforts involved in teaching the use of AAC must be sustained over a long period of time or if the work involved in teaching the use of the AAC system differs significantly from typical work efforts, support may be required in order to minimize physical or cognitive effort (Johnston, Reichle, & Evans, 2004).

Doss et al (1991) provided an example of how cognitive effort may influence communication partner behavior. They conducted two related experiments designed to examine the efficiency and effectiveness of a variety of AAC devices for ordering meals in fast food restaurants. Each experiment included the use of an introduction card that was presented to the communication partner at the beginning of the communicative interaction. In the first experiment, the introduction card stated that the user was non-speaking and that an alternative form of communication would be used. Specifically, the card stated:

“Hi! I don’t talk. I will use this device to place my order.” (Doss et al., p. 257).

In contrast, the introduction cards in the second experiment were more explicit. In addition to containing a greeting and statement that the AAC user was non-speaking, it also provided the communication partner

with information regarding the important features of that particular AAC device. For example, the introduction card for one of the electronic voice output communication aids used in the study stated:

Hi! My name is Susan. I cannot speak. I talk by using this machine. Please follow these steps in order to understand my message. 1) *Wait* for me to push buttons. 2) *Listen* to my message. Thank you. (Doss et al., p. 261).

Although it was not the sole focus of the study, results suggested that the provision of an explicit introduction card that directed the communication partner to the relevant features of the AAC system decreased the cognitive effort required for communication partners thereby enhancing the effectiveness and the efficiency of the interaction.

Quality of Reinforcement

Potential influence on the AAC user. Mace and Roberts (1993) noted that when one event is preferred over another, the preferred event has a higher quality of reinforcement. Thus, reinforcement delivered contingent on an AAC user's emission of a specific communicative behavior must be preferred over the reinforcement delivered for not using it. For example, consider an AAC user who is learning to point to black and white line drawings in a communication wallet to request food items in the school cafeteria. It seems logical that one might expect highly preferred food items to be requested more frequently.

Brady, McLean, McLean, and Johnston (1995) observed the initiation and repair behaviors engaged in by 28 individuals with severe to profound mental retardation. All participants engaged in intentional, non symbolic communicative behaviors. Opportunities were provided for the participants to request instrumental actions (e.g., request objects) as well as to request attention to objects (e.g., comment). Results revealed that the participants initiated more requests for objects than comments. One possible explanation for this outcome is that access to tangibles may have been more reinforcing than the provision of attention.

Potential influence on the communication partner. In addition to influencing the communicative behavior of AAC users, quality of reinforcement may also influence the behavior of communication partners. For example, it seems plausible that communicative interactions with AAC users that result in meaningful exchanges are likely to provide a higher quality of reinforcement to communication partners than exchanges that lack true meaning.

The influence of quality of reinforcement on communication partner behavior can be inferred from research examining the perceptions and attitudes of listeners. Light, Arnold, & Clark (2003) discuss that although the relationship between attitudes and actual behaviors towards AAC users is not well understood and is probably not one-dimensional (e.g., other factors such as peer expectations and social norms seem likely to have an influence), it seems plausible that communication partner attitudes might predispose certain behaviors. For example, an investigation by Gorenflo & Gorenflo (1991) revealed that observers had more positive attitudes towards AAC users of the same gender who were perceived to have similarities in terms of values and activities of daily living than towards AAC users of the same gender who were not perceived to have similarities in terms of values and activities of daily living. If communication partner attitudes do influence behavior, these results might suggest that communication partners will feel that communicative interactions with "like-minded" AAC users result in a higher quality of reinforcement than interactions with AAC users who do not have perceived similarities. These results might influence the design of AAC systems by ensuring that AAC users have vocabulary on their systems that will allow them to comment on the similarities between themselves and their communication partners.

Immediacy of Reinforcement

Potential influence on the AAC user. The time that lapses between producing a communicative act and the receipt of a reinforcer may also influence a learner's use of AAC. The outcomes of a study by Soto, Belfiore, Schlosser, and Haynes (1993) provide an example of the potential influence of immediacy of reinforcement. In this investigation, the researchers taught an individual with severe to profound mental retardation to use two AAC systems, a picture board (with no speech output) and a voice output communication aid. Following instruction on the use of both aids, the participant received opportunities to choose which aid to use in communicative exchanges. Results of this preference assessment revealed that the participant chose the VOCA in 100% of the opportunities. A plausible explanation of this outcome might be that the VOCA offered more immediate reinforcement (e.g., as a result of the voice output) than use of the picture board.

An investigation by Reichle and Johnston (1999) provide an additional example of the influence of immediacy of reinforcement on the behavior of AAC users. In this study, the investigators taught two beginning AAC users with severe disabilities to conditionally use communicative requests to obtain desired snack items. When items were proximally near, the learners were taught to independently reach for desired items. However, when items were in the possession of another person (e.g., teacher, peer) or proximally distant, they were taught to point to a graphic symbol to request the item. Initial results revealed that the AAC users did not consistently engage in the most efficient strategy. However, efficient and conditional use was acquired after intervention that focused on the immediacy of reinforcement.

Potential influence on the communicative partner. In addition to influencing the communicative behavior of AAC users, immediacy of reinforcement may also influence the behavior of communication partners. Wilkinson & McIlvane (2002) discuss that the amount of time that it takes to compose a message is perhaps the most frustrating aspect of graphic modes of communication. The time it takes to compose messages is likely to impact communication partner behavior especially as it relates to conventionalized exchanges (e.g., "Hi, how are you?") which King, Spoeneman, Stuart, and Buekelman (1995) indicate may comprise one third of conversations. Conventionalized exchanges are frequently brief, fast-paced exchanges. Thus, if it takes an AAC user a long time to comprise and emit this type of message, communication partners may choose not to engage in conventionalized exchanges as a result of the delay of reinforcement.

A variety of strategies for enhancing rate of communication such as the use of prefabricated messages, letter prediction, and word prediction have been reported in the literature (Silverman, 1995). Each of these strategies may serve to increase the immediacy of reinforcement for communication partners. One rate enhancement strategy that may be of particular interest to communication partners involves the provision of clues for making "20 Questions" more efficient (Garrett, Beukelman, & Low-Morrow, 1989). Frequently, when communication partners interact with AAC users who have a limited array of vocabulary on their system and whose expressive ability includes a reliable yes/no response, the partners attempt to guess the communicative intent of the AAC user by asking the AAC user a series of yes/no questions. This type of interaction often results in a significant delay in reinforcement as a result of the number of turn-taking exchanges needed to determine the AAC user's intended message. Furthermore, this strategy requires a significant amount of cognitive effort on the part of the communication partner because they are responsible for asking the probe questions and then trying to guess the intended message based on the AAC user's responses. In order to address this issue, Garrett, Beukelman, & Low-Morrow (1989) included the use of a "Clues" card as part of an AAC user's system. The clue card consisted of phrases that the AAC user pointed to in order to guide the communication partner through a structured form of 20 questions (e.g., the AAC user would point to a phrase to indicate that he/she was referring to a person, place, event, thing, or time) in order to provide more information before the communication partner starts to "guess". It seems plausible that the utilization of rate

enhancement strategies may increase the immediacy of reinforcement that the communication partners receive when interacting with AAC users.

Rate of Reinforcement

Potential influence on the AAC user. Herrnstein (1961) hypothesized that when individuals are presented with two or more functionally equivalent response options, their behavior will be directly dependent on the rate of reinforcement history associated with each alternative. The influence of rate of reinforcement may have particular significance for the design and implementation of AAC interventions. Consider an AAC user who is being taught to touch a line drawn symbol represent “help” rather than tantrum in order to obtain assistance. If all other variables were held constant, Herrnstein’s hypothesis would suggest that reinforcement must be provided more often for using the graphic symbol than for engaging in a tantrum.

Duker and VanLent (1991) demonstrated how the rate of reinforcement might impact communicative behaviors in an investigation designed to increase the variety of spontaneous signs emitted by 6 participants with severe to profound disabilities. Assessment indicated that each participant used only a limited number of the signs that they had in their repertoire. In an effort to increase the variety of spontaneous signs produced, interventionists refrained from responding to the participant’s high-rate signed vocabulary while at the same time delivering reinforcement for low-rate signed vocabulary (previously taught but typically unused). Results revealed that non-responding to “high-rate” spontaneous signs increased the participant’s use of “low-rate” spontaneous signs. Thus, manipulating the rate of reinforcement provided in response to the participants’ spontaneous communicative behaviors influenced their engagement in those behaviors.

Potential influence on the communication partner. Rate of reinforcement may also influence the behavior of communication partners. For example, consider a parent who is implementing an intervention designed to teach his child to touch a symbol to request more music as a communicative replacement for his current behavior of biting. If the intervention is effective and the frequency of biting decreases as the frequency of symbolic communication increases, the parent is receiving a higher rate of reinforcement for implementing the intervention than for refraining from implementing the intervention. If this is applied to Herrnstein’s (1961) hypothesis related to rate of reinforcement (and all other efficiency variables are equal), it seems plausible that the parent will continue to implement the intervention because he is receiving a higher rate of reinforcement for doing so. However, if the intervention is not effective and the frequency of biting does not decrease, it seems plausible that the parent may choose to stop implementing the intervention.

Combined Influence of Reinforcement Variables and Response Effort

Thus far, the four components of response efficiency have been discussed separately. However, McDowell (1988) proposed that rate of reinforcement, quality of reinforcement, response effort, and immediacy of reinforcement interact to affect the probability that an individual will engage in one behavior over another. Thus, an AAC user needs to analyze the interaction between a particular situation and the efficiency variables to determine the most efficient response to select when more than one communicative act is available. For example, in order to request assistance opening a candy bar wrapper in a darkened movie theater, an AAC user may be faced with the decision of using a natural gesture (such as tapping a communication partner’s shoulder and pantomiming his inability to open the wrapper) or touching a symbol on his communication board indicating “HELP”. In this context, the individual may choose to use the natural gesture even though it requires a greater response effort than using the communication board. Choosing a more effortful communicative act may seem out of concordance with parameters of response efficiency. However, in a dark environment, it may be impossible for the

communication partner to see the AAC system. Thus, using the natural gesture may increase the likelihood that the communicative behavior has its intended effect and may result in an increase in rate, quality, and immediacy of reinforcement.

The combined impact of the variables related to efficiency on communication partners can be inferred when examining the outcomes of an investigation by Schepis and Reid (1995) who compared the frequency of staff interactions with a learner who experienced multiple disabilities when the learner had access to a voice output communication aid compared to when she did not have access to the communication aid and relied on vocalizations and gestures. Although the authors did not report data differentiating staff initiations and responses to learner produced communication acts, results revealed that staff interacted with the learner more frequently when she had access to the voice output communication aid. These results suggest that perhaps the learner's use of the voice output communication aid provided more salient cues than the learner's use of vocalizations and gestures. From the perspective of communicative partners, interactions with the AAC user when using the voice output communication aid may have resulted in a higher quality and/or immediacy of reinforcement. Or, perhaps the communication aid with speech output was easier for communication partners to understand thereby decreasing response effort. Although additional research is necessary in order to discern which variable(s) influence the behavior of communication partners (and different variables may influence the choice behavior of communication partners differently), it seems reasonable to hypothesize that communication partners may be more likely to initiate and/or maintain communicative interactions with AAC users if using AAC speeds up exchanges (immediacy of reinforcement), makes communication interactions more explicit or understandable (quality of reinforcement), or decreases the need for the communication partner to guess or infer intent (response effort).

In summary, it is important to recognize the potential role of the four components of response efficiency (response effort, rate of reinforcement, immediacy of reinforcement, and quality of reinforcement) for AAC users as well as for their communication partners. Although most of the empirical investigations that were reported and discussed provide inferred, rather than direct evidence of the operation of the components of response efficiency, there seems to be support for considering variables related to response efficiency when developing interventions involving AAC for beginning communicators with severe disabilities. A framework for considering the variables of response efficiency when designing and implementing interventions for learners with severe disabilities is provided in the following section.

Designing Interventions with Response Efficiency in Mind

Examining the role of response efficiency for AAC users as well as communication partners when designing and implementing interventions may increase contextual fit. Figure 1, below, provides a planning form that considers the four components of response efficiency when designing or troubleshooting AAC interventions. As discussed by Mace and Roberts (1993), the first step in incorporating the variables related to response efficiency into an intervention involves collecting information on the efficiency of the current behavior. After obtaining information regarding the efficiency of the current behavior, interventionists can formulate an intervention procedure that competes with the current behavior across the four variables of response efficiency. As noted by the planning form in Figure 1, interventionists are prompted to compare the efficiency of the current behavior to the efficiency of the desired behavior for AAC users or communication partners in order to ensure that the desired behavior is relatively more efficient. As discussed previously, McDowell (1988) proposed that the four components of efficiency (rate of reinforcement, quality of reinforcement, response effort, and immediacy of reinforcement) interact to affect the probability that an individual will engage in one behavior over another. Thus, when designing interventions with response efficiency in mind, it may not be necessary (or even possible) to ensure that the desired behavior is more efficient than the current behavior across all four

variables. Rather, interventionists should strive to develop interventions where, overall, the new behavior is more efficient than the existing behavior.

Planning Form for Evaluating Response Efficiency Variables

Efficiency is being considered for (circle one): AAC User Communication Partner

Name of Individual(s) completing Planning form: _____

Variable	Current Behavior: _____	Desired Behavior: _____	Circle the Behavior that is More Efficient
Response Effort	The physical effort required to engage in the current behavior is (circle one): <i>High Medium Low</i> The cognitive effort required to engage in the current behavior is (circle one): <i>High Medium Low</i>	The physical effort required to engage in the desired behavior is (circle one): <i>High Medium Low</i> The cognitive effort required to engage in the desired behavior is (circle one): <i>High Medium Low</i>	<i>Current</i> <i>Desired</i> <i>No Difference</i>
Rate of Reinforcement	Observation reveals that the current behavior is reinforced ___% of the time (insert percentage).	Intervention is designed to ensure that the desired behavior is reinforced ___% of the time (insert percentage).	<i>Current</i> <i>Desired</i> <i>No Difference</i>
Quality of Reinforcement	The quality of reinforcement for engaging in the current behavior is (circle one): <i>-highly non-preferred</i> <i>-non-preferred</i> <i>-neutral</i> <i>-preferred</i> <i>-highly preferred</i>	Intervention designed to ensure that the quality of reinforcement for engaging in the current behavior is (circle one): <i>-highly non-preferred</i> <i>-non-preferred</i> <i>-neutral</i> <i>-preferred</i> <i>-highly preferred</i>	<i>Current</i> <i>Desired</i> <i>No Difference</i>
Immediacy of Reinforcement	The current behavior results in immediate reinforcement: <i>YES NO</i>	Intervention is designed to ensure that the desired behavior results in immediate reinforcement: <i>YES NO</i>	<i>Current</i> <i>Desired</i> <i>No Difference</i>

Figure 1. Planning form for Designing AAC interventions relative to response efficiency variables

Future Research

Siegel and Cress (2002) emphasize that communicative interactions are experienced mutually by AAC users and their communication partner and that both the AAC user and the communication partner are mutually affected in social interactions. Thus, experimental investigations are needed to explore (a) ways to increase the contextual fit of AAC interventions, (b) the impact of efficiency variables on the

behavior of AAC users, and (c) the impact of efficiency variables on the behavior of communication partners.

Enhancing the Contextual Fit of AAC interventions

Albin et al. (1996) suggest that the biggest positive outcome resulting from strong contextual fit is implementation of the intervention plan. Enhancing contextual fit may alleviate many of the problems encountered by practitioners which include, but are not limited to, situations where (a) AAC systems are developed but not used by AAC users or communication partners, (b) the use of AAC systems by AAC users and/or communication partners is not generalized across a wide array of environments, or (c) the use of AAC systems by AAC users and/or communication partners is not maintained across time. Empirical work is needed to determine the most efficient and effective strategies for enhancing contextual fit when designing AAC interventions as well as for monitoring the contextual fit of AAC interventions on an ongoing basis.

Exploring the Impact of Efficiency Variables on the Behavior of AAC Users

To date, much of the research exploring the impact of efficiency variables on the behavior of AAC users has explored strategies for teaching a new behavior as a replacement to an existing, socially inappropriate, behavior. However, to be maximally efficient in acting on one's environment it is important to learn a variety of different social forms that can be used to achieve the same social outcome. Selecting among different social forms is determined, for the most part, by the relative efficiency of each form in a given situation (Reichle & Johnston, 1999). Additional empirical work is needed to explore the impact of efficiency variables on the behavior of AAC users when the AAC user has two or more socially appropriate forms in their repertoire. This is particularly important as interventionists strive to teach AAC users the conditional use of communication that requires an AAC user to engage in the most efficient behavior given the unique features of a specific physical and/or social environment.

Exploring the Impact of Efficiency Variables on the Behavior of Communication Partners

To date, there is only inferred (as opposed to direct) evidence of the operation of the components of response efficiency on the behavior of communication partners. Empirical work is needed in order to discern the extent to which efficiency variables influence the behavior of communication partners. Empirical investigations should also explore the extent to which factors such as age, gender, and familiarity with the AAC user influence the choice behavior of communication partners.

Summary

In sum, this paper (a) examined the importance of contextual fit in the design and implementation of AAC interventions, (b) explored the potential role of response efficiency for enhancing contextual fit, (c) presented a framework for examining the response efficiency of AAC interventions, and (d) provided a discussion of needed research. It seems likely that enhancing the efficiency of AAC for AAC users as well as communication partners will serve to increase contextual fit thereby increasing the overall effectiveness of AAC interventions.

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