Interventions for Students with Traumatic Brain Injury: Managing Behavioral Disturbances

Thomas J. Kehle, Elaine Clark, and William R. Jenson

Abstract

The present article provides information about the behavioral sequelae that are commonly seen in children and adolescents following a traumatic brain injury (TBI) and ways that educators can begin to address these problems. Because, for the most part, behavioral interventions have not been empirically validated for use with TBI populations, this article focuses on the unique needs of these students and the factors that should be considered in designing intervention strategies. Emphasis is placed on the cognitive sequelae of TBI that can cause further behavioral problems and interfere with interventions (e.g., impaired attention, executive function, reasoning and problem solving, and learning and memory).

Traumatic brain injury (TBI) is the most common cause of acquired disability in childhood and adolescence (Michaud, Duhaime, & Batshaw, 1993). Although the nature and severity of the disability is largely a function of the neuropathological features of the injury itself, cognitive and behavioral problems are fairly common (Di Scala, Osberg, Gans, Chin, & Grant, 1991). Cognitive problems, although considered by many to be the most disabling sequelae of injury (Capruso & Levin, 1992), are not the only problems that cause concern. According to Levin (1987), family members are more distressed by the behavioral disturbances. This is not surprising, given the fact that research has shown that parents of children and adolescents who sustain a TBI report the same behaviors in their children as parents who have children in behavior disorders (BD) classrooms (Michaud, Rivara, Jaffe, Fay, & Dailey, 1993). Both groups of parents describe their children as having poor attention and concentration, distractibility, hyperactivity, irritability, low frustration tolerance, poor motivation, apathy, poor anger control, aggression, and anxiety, and as experiencing social isolation and resorting to substance abuse (McAllister, 1992; Michaud, Duhaime, & Batshaw, 1993; Rosenthal & Bond, 1990).

In addition to the externalizing behaviors that children with TBI are reported to show, many have internalizing problems as well. McKinlay, Brooks, Bond, Martinage, and Marshall (1981) found that approximately 70% of their sample displayed irritability. Silver and Yudofsky (1987) found about the same rate of aggression in their sample. Although irritability is not targeted for intervention as often as aggressiveness is, it is commonly found to be a precursor to more disruptive and assaultive behaviors (McKinlay et al., 1981). Behavioral problems, whether externalizing or internalizing, do not resolve as quickly or spontaneously as some other problems (e.g., motor control; Di Scala et al., 1991). If cognitive deficits underlie or contribute in some way to the behavioral disturbances, then recovery is going to take even longer—at least as long as resolving the cognitive impairments. Cognitive deficits often take the longest time to recover from the impact of injury (Di Scala et al., 1991). Perhaps, this is due in part to the fact that so many variables determine the outcome from cognitive disabilities. Besides the injury itself, researchers have shown that variables as diverse as the number of parents living in a household can affect the outcome; for example, younger children from single-parent homes experience less complete cognitive recovery than older children from two-parent households (Tompkins, Holland, Ratcliff, & Costello, 1990).

Although behavior problems in TBI populations have been the topic of discussion in many articles and the subject of numerous scientific investigations, studies that specifically address the validity of interventions with this population are almost nonexistent. Because behavior problems can seriously limit these students' academic and social success (Rosenthal & Bond, 1990), it is critical that educators use the most effective management strategies available. Given the fact that scant empirical data exist to support the use of one strategy over another, educators will have to rely on strategies that have been empirically supported with other populations of children and adolescents who have behavior problems (i.e., behavior disorders). Although there are no data to even suggest a "preferred," let alone best, practice with children and adolescents

JOURNAL OF LEARNING DISABILITIES
VOLUME 29, NUMBER 6, NOVEMBER 1996
PAGES 633-642

who suffer the consequences of TBI, what is known about the impact of TBI on behavior and cognition may be helpful in adapting interventions that are accepted practice for reducing maladaptive behaviors and increasing desired behaviors. The present article emphasizes the need to adapt behavioral strategies in accordance with the cognitive deficits that these students commonly have. These deficits not only have the potential to affect behaviors, including emotional expression, but also can interfere with planned treatments. Mapou (1992), however, noted that treating behavior problems associated with cognitive deficits may actually be easier than trying to treat long-standing personality traits or well-established behavior patterns.

Behavioral Sequelae

Defining the Problem

Researchers have found an excessive rate of behavior disturbance in children who sustain a severe TBI even if they have had no prior history of behavior problems, developmental problems, or central nervous system damage, including head injury (Asarnow, Satz, Light, & Lewis, 1991). Certain populations, however, have been shown to be at substantially greater risk for developing behavior problems following injury. Young males from impoverished and dysfunctional families are an example of this higher risk category (Michaud, Rivara, et al., 1993). Although some have argued that preexisting problems, such as poor judgment or impulsivity, predispose children and adolescents to injury (Rosenthal & Bond, 1990), a causal relationship has not been established. According to Donders (1992), relatively few individuals with TBI have prior histories of behavioral disorders. This conclusion was drawn from a study showing that less than 11% of the participants were described by parents and teachers as having behavior problems before their injuries. Regardless of the exact nature of the relationship between prior behaviors and sequelae following TBI, research has shown that when prior problems did exist, or a person had a predisposition for disturbance (e.g., lack of environmental support and deprivation), the outcome tends to be worse than in cases where there is no such prior history (McAllister, 1992).

Worse outcome is not associated only with premorbid characteristics; it is also strongly associated with the severity of the injury. Research has documented that the more severe the injury, the more likely it is that a child or adolescent will have behavioral sequelae (Asarnow et al., 1991; Fay et al., 1994; Fletcher, Ewing-Cobbs, Miner, Levin, & Eisenberg, 1993). Researchers have also shown that once present, these behavior problems tend to persist, and may even get worse over time. According to a study by Brown, Chadwick, Shaffer, Rutter, and Traub (1981), over a 2-year period, children with severe TBI showed about a 300% increase in behavior problems. Fay et al. (1994) at the University of Washington also showed that some children with moderate or severe TBI continued to have behavioral problems 3 years after injury. In the Washington study, the participants with moderate or severe TBI performed worse than matched controls on 40 of 53 variables. The data demonstrated that, in addition to behavioral problems, intelligence, adaptive problem solving, memory, achievement, motor performance, and independent living skills were impaired.

Although some researchers have indicated that regardless of injury severity, children who sustain a TBI are more likely than their uninjured peers to be left with functional limitations, including behavioral problems (Greenspan & MacKenzie, 1994), those studies are relatively few in number. The studies that do exist often rely on questionable methodology, such as telephone interviews with parents. Prospective studies of mildly injured children that include face-to-face assessments tend to show that mild injuries have negligible effects on behavior (Jaffe et al., 1993; Knights et al., 1991). Further, these studies demonstrate that children and adolescents with mild TBI are indistinguishable from peers without TBI histories (Bijur, Haslum, & Golding, 1990). In a study comparing mild TBI with other hospitalized populations, after controlling for hyperactivity before the age of 5, Bijur et al. found that children treated for burns and lacerations did as poorly as or worse than children with TBI on measures of behavior and cognition.

It is unclear what explains the report of behavioral disturbances and cognitive problems in children and adolescents who sustain mild TBI. Some are of the opinion that the measures used are not sensitive enough to assess subtle problems, while others believe that parents tend to overreport problems as a result of the emotionally charged nature of the injury (Casey, Ludwig, & McCormick, 1986). According to Casey et al., TBI is often associated with abrupt behavioral changes, including loss of intellect and serious behavior problems, thereby causing parents to overreport, and over-attribute to injury, problem behaviors. This, however, is not always the case. In fact, at times, parents or school personnel do not believe the TBI to be the cause of a child's disruptive behavior (Michaud, Rivara, et al., 1993). This may be due to the fact that dysfunctional behaviors are not immediately apparent. According to Michaud, Rivara, et al., the longer the interval between the age of a TBI and the onset of behavioral and academic problems, the less likely it is that problems will be attributed to the brain injury. The researchers found, however, that the likelihood of having had a prior TBI among special education students in BD classes is three times higher than the rate of TBI in general classrooms.

Neuropathological Considerations

Research has shown that as damage increases (e.g., affecting diffuse areas

of the brain), so does the probability that behavior problems will occur (Wood, 1987). Although the relationship between behavioral sequelae and damage to frontal and temporal regions has been well established, relationships between other areas of the brain and behavior are not as clear (Mapou, 1992). Mapou contended that, whereas some areas do not have much impact on behavior, other areas account for most of behavior. He argued that damage to the frontal region alone could account for the majority of behavior problems seen in populations with TBI.

Given the fact that damage almost always occurs in the frontal region, and very frequently occurs in the temporal area, regardless of the location of impact to the skull (Mapou, 1992), certain sequelae can be expected. Although no particular behavioral patterns have been found following injury, researchers have found patterns of cognitive impairments (Dalby & Obrzut, 1991). When frontal regions of the brain are damaged, impairments in attention, executive functioning, reasoning, and problem solving can be expected (Levin, 1987). Similarly, when damage takes place in the temporal regions, problems with new learning and memory consolidation can occur (Levin, 1987). Although such damage can have a direct impact on behavior (e.g., poor emotional control), it is difficult to predict the exact nature of these behaviors unless cognitive factors are taken into account. Consideration of cognitive deficits, in fact, may prove critical for designing effective behavioral interventions.

Cognitive Deficits That Affect Behavioral Sequelae

A number of cognitive problems need to be considered in terms of potential for affecting behavior. Poor attention is a particularly important factor to consider. Problems with attention are commonly seen following TBI (Jaffe et al., 1993) and can be one of the greatest barriers to treatment. Inattention reduces individuals' ability to comprehend what is taking place in their environment and reduces their chances of benefiting from learning experiences. When inattention is left untreated, learning can be seriously disrupted, which, in turn, can disrupt behavior. It is not surprising to find that irritability and aggression are common among TBI populations who have impaired attention (Mapou, 1992).

Other cognitive deficits that have the potential to interfere with appropriate behavioral responses pertain to executive functions. These functions are important for behavioral control, as they involve planning, initiating, and executing goal-directed behaviors. These problems, which are rather common in individuals who sustain a TBI (Levin, 1987), can impair a person's ability to mentally solve problems and to act on those solutions. For some, there is not even the motivation to engage in purposeful behaviors. As with poor executive functioning, it is fairly obvious to see how poor insight and judgment can interfere with appropriate behavioral responding. As Mapou (1992) noted, these problems can lead to circular arguments and escalating behaviors.

Problems with learning new information, or even remembering old, can be devastating to a person's progress and can lead to problems with self-esteem and depression. Even certain therapies may be less effective as a result of the person's inability to retain information. Problems with learning and memory not only are frustrating but also reduce the chance that a person will be able to learn from his or her own experiences.

Intervention Strategies

Examples of Common Behavioral Sequelae

Although the behavioral sequelae following injury are diverse, some behaviors are particularly relevant to a discussion of intervention strategies; aggression and noncompliance are two of these. These behaviors are highly interrelated and appear to be a combination of neurophysiological, constitutional, and environmental factors. Neither behavior, however, appears to be linked to any specific cause of brain injury. Aggression and noncompliance have been found in children who suffer head injuries, but also in children who have central nervous system infections, hemorrhages, and hypoxia (Wood, 1987). They also occur in populations with no known history of central nervous system involvement (Kehle, Clark, Jenson, & Wampold, 1986). It can therefore be assumed that any focal or diffuse brain damage that affects the systems involved in the regulation of emotion and behavior can cause behavioral disturbances such as these (McAllister, 1992).

According to Wood (1987), aggression in children and adolescents with TBI often takes one of two forms. The first is impulsive, unprovoked aggression, or what he called "episodic dyscontrol" (p. 141). The second is an overreaction to situations due to poor emotional control. The first type tends to involve more random acts of violence and destructiveness, whereas the second seems to be more provoked. Often, the second type is also initially manifested as irritability, which tends to escalate into an angrier emotional response. Although both types of aggression are seen in a variety of injuries, the former is often associated with temporal lobe damage, whereas the latter has been associated with damage to the frontal lobes (Mapou, 1992).

Noncompliance is a more pervasive childhood behavior that is learned and reinforced when escalating noncompliance and disruptiveness terminates behavioral commands (Rhode, Jenson, & Reavis, 1993). Noncompliance can, however, be secondary to brain injuries that affect cognitive skills involved in the assessment of social situations (e.g., processing information, reading social cues, understanding cause and effect, remembering and generalizing from one situation to the next; Begali, 1992).

Antecedent Classroom-Based Strategies

With regard to the treatment of behavioral sequelae in TBI populations, Franzen and Lovell (1987) outlined two general principles. The first involves reducing the antecedents that elicit inappropriate behavior, such as noncompliance. The second principle involves reducing the probability that an inappropriate behavior, such as aggression, will be reinforced in the first place. Installing effective classroom-based antecedent strategies are examples of the first principle. These preplanned classroom strategies are fundamental, and their effectiveness is largely related to the degree that they correctly anticipate problem behaviors. Examples of these proactive intervention strategies include the public posting of classroom rules, classroom scheduling, structuring classroom space, and teacher movement about the room (Rhode et al., 1993). For students who have problems with reasoning and problem solving, or have difficulty remembering, these strategies may be helpful.

Publicly Posted Rules. Publicly posted classroom rules function to define expected student behaviors. Posting rules in the classroom also serves to remind students who might otherwise forget them. Although the reasons for the rules should be clearly explained, for students with reasoning problems, this may not be relevant. Such students should not, however, have a problem understanding the consequences for compliance or noncompliance if they are concrete and presented clearly. Several characteristics of good proactive rules are important for the student with TBI. These include being specific, tying rules to consequences, making sure rule breakage is measurable, and, if possible, stating the rules in a positive manner (Rhode et al., 1993). For students who have problems controlling their emotions, especially anger, positive statements are likely to be important. Students with problems comprehending will probably find the specific and concrete nature of the rules to be quite beneficial. Keeping the number of rules short can also help the student who has difficulty learning and remembering.

Scheduling. The time devoted to instructional activities should typically constitute no less than 70% of the school day (Rhode et al., 1993). However, students with TBI may not have the attentional capacity to tolerate this amount, and thus adaptations will have to be made. The amount and degree of student engagement in instructional activities can be improved by augmenting the curriculum with peer tutoring and cooperative learning approaches. This may also help to increase a student's awareness of behavioral expectations of the class and improve his or her compliance. For students who can attend well, using interactive software may be of some benefit for improving class performance by addressing underlying cognitive processing problems.

Structuring Class Space and Teacher Movement Around the Room. When assigning student seating, teachers should place students who have disruptive behaviors near them and away from other students with behavior problems. According to Rhode et al. (1993), seating students near teachers allows for better anticipation of problem behaviors and more opportunity for reinforcing appropriate behaviors. For the student who has problems initiating behaviors, this will be particularly important. Reducing distractions will also benefit those students who have attentional and memory problems. In addition, there is considerable evidence in support of the relationship between teacher movement around the room and appropriate social behavior (Rhode et al., 1993). For these students, opportunities for repetition and frequent reinforcement will be a benefit. Positive antecedent strategies are employed to communicate to the student that appropriate and functional behavior will be expected, appreciated, and rewarded. The knowledge of such reward promotes student motivation and improves compliance. Recognition of appropriate behavior should, therefore, be continuous and embedded in the teacher–student dialogue.

Consequential Classroom-Based Interventions

Effective Use of Teacher Reprimands. The most common and preferred method that teachers employ to deal with student noncompliance and aggressiveness is a reprimand. Typically, embedded within the reprimand is the threat of punishment if student compliance is not forthcoming (Reavis, Jenson, Kukic, & Morgan, 1993). Incredibly, elementary and junior high school teachers deliver a reprimand every 2 minutes, on average. In senior high, the rate falls to one every 4 minutes (Reavis et al., 1993; White, 1975). The frequency of reprimands is, to a degree, correlated with the student's ability level (Heller & White, 1975). It has been shown that students who have cognitive disabilities or significant social skill deficits are more likely to receive substantially higher rates of teacher reprimands. This is a particular concern for some students with TBI. Malec (1984) warned that punishers can have a negative effect on these students' mood, initiative, and self-esteem. Deaton (1994) stressed the importance of using positive reinforcements to change the behavior of children with TBI.

Because the appropriate use of reprimands, however, has been shown to temporarily improve student compliance and has also improved academic competence (Reavis et al., 1993; Van Houten, Nau, MacKenzie-Keating, Sameoto, & Calavecchie, 1982), this strategy should not be neglected. The use of reprimands, though, should be infrequent and should be used when other, more positive interventions have failed. To ensure that reprimands have

a positive, enduring effect, they should (a) be employed sparingly and in combination with other strategies (Van Houten & Doley, 1983), (b) include the use of preplanned and reasonable consequences if indicated, (c) be monitored so that the rate of reprimands relative to reinforcing statements is at a substantially lower rate, and (d) be presented correctly (Reavis et al., 1993).

The correct presentation of a reprimand involves several variables, including the distance the teacher stands from the student who is to be reprimanded, the amount of time given to the student to comply, how the teacher faces the student, and the tone of the reprimand (Reavis et al., 1993). Student compliance rates increase when reprimands are embedded in a precision request that is in the form of a statement rather than a question. Rather than asking the student if he or she wants to do something, it is more effective to tell the student it is now time to do something. This may be critical for individuals who have difficulty organizing their thoughts and problem solving. After the request is made, the teacher should wait approximately 3 to 5 seconds in order to give the student sufficient time to respond. The reprimand or request should be made after establishing eye contact with the student. It is also important to make the command within a distance of approximately 3 feet. The request typically should not be made more than two times; however, if attentional problems are interfering with a student's compliance, then further repetitions may be necessary. If judged appropriate, touching a student's shoulder immediately prior to the request or reprimand also enhances the student's compliance. The tone of the teacher's voice should be firm, relatively quiet, and lacking emotionality.

In addition to the above, initially requesting compliance from normally tractable students who are seated near the noncompliant student will increase the probability that that student will acquiesce to the teacher's request. In addition, the teacher can build a momentum of compliance by having the noncompliant student respond to positive and enjoyable requests immediately prior to a less preferred or aversive request (Reavis et al., 1993).

Incorporating specificity into reprimands and requests for compliance increases the probability that a student will respond in a positive manner. It is more effective to describe the exact behavior desired than to give general or vague reprimands. The teacher should also socially reinforce student compliance with a request or reprimand. A preplanned negative consequence, such as time-out, however, can help to ensure compliance if the student is not responsive to reprimands or requests for compliance after being given ample direction and opportunity to respond. Time-out for students with TBI, as for all students, must be used in a manner that ensures student safety.

Precision Requests and "Sure I Will." Precision requests can be employed to increase appropriate classroom behaviors and decrease inappropriate behaviors. In combination with the previous suggestions regarding the use of reprimands, precision requests incorporate the following sequence (Reavis et al., 1993):

> (1) If a second request is needed, use the key word, "*need*."
>
> (2) If the request is followed, use a social reinforcer (e.g., praise).
>
> (3) If the request is not followed, use a mild pre-planned negative consequence.
>
> (4) After the negative consequence has been delivered, repeat the request cycle again until the student follows the request (p. 5).

One difficulty with noncompliant and aggressive students is teaching them to substitute appropriate and adaptive behaviors for the inappropriate and maladaptive behaviors. Use of the "Sure I Will" program along with precision requests facilitates this substitution (Rhode et al., 1993). "Sure I Will" is the process of teaching the student to respond to teacher requests for compliance with the response, "Sure I will," or a similar statement (e.g., "No problem," "Okey dokey," etc.) implying a timely and willing acquiescence. If the student is randomly reinforced for stating, "Sure I will," and the whole procedure is combined with a precision request, compliance rates should be expected to improve (Rhode et al., 1993). According to Rhode et al. (1993), simply uttering the phrase "Sure I will" assists the student in starting the requested behavior and is incompatible with noncompliant and argumentative behaviors. For students who have problems with attention, this element will likely be important. The teacher should reward only genuine "Sure I will"–type responses. After implementation, the criteria for reinforcement should be gradually increased until rewards are given for only exceptional performance. The program can be combined with the use of "mystery motivators" and/or a response–cost procedure to further increase its effectiveness in reducing the student's noncompliance. Using mystery motivators, as described by Rhode et al., entails writing the name of a desirable reinforcer on a piece of paper and sealing this inside an envelope. The envelope is then displayed in a prominent location in the classroom or home (e.g., on the chalkboard or refrigerator). The teacher then takes a monthly calendar and randomly places an *X* on the days when reinforcers will be given. All days are then covered up by using something like a self-sticking dot. The student is given the mystery motivator envelope only on days that he or she has earned a reward and the *X* appears for that day. If no *X* appears, then the student waits for the next day to peel off a dot.

This system creates high anticipation and a visual reminder of what has to be done to earn a chance at the mystery motivator. In cases where reinforcements are difficult to select,

or novelty is required (e.g., students with impaired executive functions), mystery motivators may prove to be an effective strategy.

Effective Use of Teacher Praise. One of the most basic and common strategies employed in educational settings for children with behavior disorders is the use of praise. Praise is defined as any behavior, verbal or nonverbal, that communicates approval. Its effectiveness has been well documented (e.g., Shutte & Hopkins, 1970), despite the fact that teachers use praise relatively infrequently (Thomas, Becker, & Armstrong, 1968). At each successive grade level, praise is used with decreasing frequency (White, 1975). Reavis et al. (1993) outlined an I-FEED-V procedure for the effective implementation of praise. Praise should be delivered *i*mmediately, *f*requently, with *e*nthusiasm, and after establishing *e*ye-contact with the student. Further, the teacher should *d*escribe in detail the appropriate behavior and should use a *v*ariety of statements when communicating praise.

Reavis et al. (1993) suggested that praise statements should exceed reprimand statements by a 4 to 1 margin. If this does not work for the student who requires more consistent reinforcement, alter the ratio (e.g., to 8 to 1). Also, the teacher should be sensitive to the individual student in regard to when praise is appropriate: For some students, public praise would not be rewarding but, rather, would be embarrassing. For example, students who are sensitive about their loss in functioning may not find this attention rewarding. In these cases, praise should be delivered in an unobtrusive manner (Reavis et al., 1993).

Augmented Self-Modeling. Observational learning is the behavioral or cognitive change that occurs as a result of observing and copying a model's behavior. The model can be live, filmed, or even imagined. The relatively efficient learning that occurs as a result of observing and copying other students' behaviors is related to the degree the student (a) identifies with the model, (b) has an incentive to imitate the model, (c) attends to the model, and (d) has an opportunity to practice and match the model's behavior (Bandura, 1986). These variables can be maximized by employing the student as his or her own model. Self-modeling is accomplished by constructing edited videotapes depicting the student exhibiting only desired or exemplary behaviors. In the case of students with disruptive behaviors, such as aggression, all instances of these behaviors would be edited out of the intervention tape, leaving only desired and exemplary behaviors. In addition to resultant imitative learning, the student's efficacious beliefs are also altered to be consistent with the exemplary behavior that is depicted in the edited videotapes (Kehle et al., 1986). The loss of self-confidence and self-esteem frequently seen in children with TBI makes self-modeling a particularly appealing intervention. It is also appealing because it can be adapted so that minimal attentional, initiating, and problem-solving skills are necessary to benefit from it. Even students with problems in learning can benefit from the procedure after repeated exposure.

In several published studies, the results of self-modeling interventions have been quite impressive (e.g., Kehle et al., 1986; Kehle & Gonzales, 1991). The reliability and potency of the self-modeling intervention, however, has been enhanced by incorporating other cognitively and behaviorally based strategies, such as spacing effects, mystery motivators, and self-reinforcement (Kehle, Sutilla, & Visnic, 1994). Following is an example of how self-modeling was used with an extremely noncompliant and aggressive 9-year-old student (Gretchen) who sustained a TBI 1 year ago. First, the professional in charge of the intervention required an edited videotape depicting the child complying with the classroom teacher's requests during ongoing class instruction. In Gretchen's case, the help of the school psychologist was solicited. After the school psychologist's unsuccessful attempt to get Gretchen to respond to the teacher's requests, her father was brought into the class to make the same requests while being videotaped. Gretchen complied with his commands. The tape was altered, however, to show her complying with her teacher's requests, not her father's. A 7-minute tape was shown back to her on five different occasions over a period of 4 weeks, to ensure that the treatment was properly spaced over time. Spacing effects have been heavily investigated and shown to be one of the most remarkable phenomena to emerge in the 100-year history of research on learning (Dempster, 1988). For example, two spaced presentations can be twice as effective as two massed presentations. Surprisingly few interventions, however, incorporate this into their designs (Kehle, Jenson, & Clark, 1992).

Prior to the beginning of the intervention with Gretchen, the school psychologist tacked a manilla envelope to the bulletin board in the front of the class. On the envelope was a big question mark and Gretchen's name. The class was told that the envelope contained a "mystery" motivator, a gift that Gretchen would really like and could have following compliance with the teacher's requests. (As noted earlier, mystery motivators are designed to increase the anticipation and value of a reinforcer.)

During the viewings of the tape, Gretchen was instructed to stop the tape whenever she thought she responded appropriately to the teacher's request. Each time Gretchen stopped the tape, she was allowed to choose from a variety of small reinforcers displayed on a table near the video monitor, regardless of whether her behavior on the tape was appropriate. Charting Gretchen's compliance with teacher commands was also taking place. A minimum daily compliance rate of 80% was set for Gretchen in

order for her to receive the mystery motivator. Gretchen received the reward several times throughout the intervention. Just in case students missed the improvement in Gretchen's behavior, with her permission, the edited tape was eventually shown to the rest of the class. This showed classmates that she was capable of behaving appropriately and also served to increase peer expectations for Gretchen's improved behavior.

Use of Reductive Procedures. Time-out is defined as the removal of the student from a reinforcing environment, with subsequent placement in a less reinforcing environment for some period of time contingent on a specific misbehavior (Reavis et al., 1993). Franzen and Lovell (1987) emphasized that the environment from which the child is removed must be relatively more reinforcing than the time-out setting. For students seeking a quiet place where stimulation and demands are reduced, this may not be an appropriate intervention. Time-out, however, is a very potent reductive technique for children with behavior disorders (Rhode et al., 1993). Reavis et al. described a continuum, based on restrictiveness, of nonreinforcing environments that can be employed as time-out settings. These range from leaving the child at his or her desk or in the instructional setting to in-class seclusion to removal from the classroom and placement in a separate secluded setting. Perhaps the least restrictive form of time-out is simply ignoring the student's inappropriate behavior for a specific amount of time. It is only effective, however, if the teacher's attention is reinforcing to the student.

Withdrawal of the misbehaving student's work materials is relatively more restricting than simply ignoring the him or her. The work materials are removed without comment and the student is required to sit at his or her desk. With younger children, the teacher can assign a time-out to a valued object belonging to the child—the favored toy or object is removed for a specific period of time contingent on the child's behavior. Rhode et al. (1993) described such an in-class time out procedure called "Bumpy Bunny Time Out" in their book, *The Tough Kid Book*.

More restrictive is the employment of a time-out ribbon. This procedure, developed by Foxx and Shapiro (1978), is effective with younger children who exhibit particularly difficult behaviors. Ribbons are given to all of the students in the class; the ribbons are required for children to participate in any class activity. The ribbon is removed if the child misbehaves. Without a ribbon, the student is ignored by the teacher and the entire class. For students who have suffered loss in self-esteem or are having problems relating socially, this technique should be used only after careful consideration of other alternatives.

Reavis et al. (1993) also described a contingent observation time-out, whereby a student is placed away from the class; he or she can still observe all of the class activities but is ignored by the teacher and classmates. A slightly more restrictive rendition of the contingent observation time-out is the no-look time-out: The student is instructed to close his or her eyes, place his or her head on the desk for a specific amount of time, or face a wall. The student may also be placed behind a screen.

Time-outs that involve removal of the student from the classroom for a specific amount of time are substantially more restrictive and include the student being seated in the hall, placed in another classroom, put in in-school suspension, or placed in a dedicated time-out room. Although Reavis et al. (1993) found the use of time-out in another classroom to be helpful—for instance, in a class one or two grades above the student's placement—it is unclear what impact this would have on the student with TBI who has academic problems and who may feel self-conscious. Placing the student in a classroom where students are well behaved and engaged in academic work, however, may be helpful and needs to be considered.

Behaviors that necessitate the use of a dedicated time-out room should be relatively serious, such as physical aggression, destruction of property, and severe noncompliance. The amount of time the student spends in time-out is generally 1 minute for each year of the student's age. Depending on the cognitive level of the child with TBI, this may have to be altered. Reavis et al. (1993) outlined numerous procedures for the correct implementation of time-out in a dedicated room, and these seem appropriate for the student with TBI: The staff should knowledgeable about, and have allegiance to the correct implementation of, the procedures; they should have themselves experienced being in time-out; the student's parents must support the use of time-out, and the procedures must be part of the student's Individualized Education Program; the procedure should be described to the student prior to its implementation; and conversation with the student should be suspended after he or she is instructed to go to time-out.

The use of a dedicated time-out room necessitates the continuous observation of the student by a professional, or paraprofessional, during such placement. This can be accomplished by having a 180-degree peephole installed in the door. Reavis et al. (1993) also suggested that the door to the room be designed so that the adult on the outside must hold the door handle in a locked position. If the student refuses to go to time-out, two things may be necessary: One minute of time for each request to go to time-out is added; and/or the previously acquired skill of manual guidance is employed by whoever is in charge of the intervention. If there is a possibility of physical aggression, additional staff may be required.

Overcorrection. Another effective but relatively intrusive reductive technique is overcorrection. Overcorrection is the enforced practice of behaviors

incompatible with the inappropriate behavior after that behavior occurs (Franzen & Lovell, 1987). For example, if the student complies with the teacher's request to sit down but emits a verbally inappropriate response while doing so, the teacher may require the student to practice an appropriate response (e.g., "Sure I will") for a specific period of time. Overcorrection is designed both to eliminate undesired behavior and to teach appropriate behavior (Franzen & Lovell, 1987). For students who have memory problems, this will certainly provide them with the opportunity for repeated practice. Again, one of the critical issues with these students is that their self-esteem not be damaged in the process. Some students may find this procedure to be humiliating.

Pharmacologic Treatments

Pharmacologic treatments that alter central nervous system (CNS) functioning have been useful in reducing emotional outbursts and aggressive behaviors (Yudofsky, Silver, & Schneider, 1987). Pharmacologic treatment, in fact, has become an increasingly important therapeutic option for the management of postinjury behavior disruptions (Rose, 1988). This should not be too surprising, given the impact that brain injury has on the mechanisms that control emotions and behavior. Medications that have been used to increase attention and reduce aggression in children who have sustained brain injuries include anticonvulsants (e.g., Tegretol and Depakote); benzodiazepines (e.g., Clonidine and Valium); neuroleptics (e.g., Haldol); antidepressants (e.g., Tofranil, Prozac, and Zoloft); stimulants (e.g., Ritalin and Dexedrine); and lithium salts.

Research has demonstrated the effectiveness of a number of these medications (e.g., Clark, Baker, Gardner, Pompa, & Tait, 1990; Glenn, 1987a; Haas & Cope, 1985; Siassi, 1982). Clark et al., for example, showed that stimulant medication can be effective in improving the attending behavior of children who sustain a TBI. The overall number of studies, however, are few (Cope, 1987). Given the fact that various neurochemical mechanisms can be involved in the development of disruptive and aggressive behaviors in individuals who have brain injury, it may be more difficult to determine an effective medication protocol. Consequently, the use of pharmacologic treatment by medical personnel for individuals with TBI needs to proceed with caution (Glenn, 1987b). Glenn (1987a) stated that the best way to begin pharmacological management of aggressive and disruptive behaviors is by withdrawing sedating drugs and administering stimulant medications, such as methylphenidate. These medications not only improve alertness, attention, and initiation, but also have a calming effect on many of these children. Being even more cautious, Cope (1987) stated that "unless a true behavioral emergency exists, the primary approach to disordered activity in TBI should be environmental or behavioral" (p. 4). He presented three arguments for this advice. First, the behavioral approach establishes baselines that the physician can use to judge the effectiveness of neuropharmacologic intervention if it becomes necessary. Also, Cope claimed that neuropharmacologic agents appear to be successful in that they function to depress the patient's state of arousal. Therefore, control of maladaptive behavior is gained at the expense of dampening the patient's adaptive behavior. Finally, the nosology of TBI is inadequate and, therefore, accurately predicting which individual will respond to a particular neuropharmacologic agent is impossible (Cope, 1987).

Conclusions

Behavioral disturbances, like cognitive impairments, can be quite disabling and cause considerable distress for the individual who has sustained the injury and his or her family. If not properly treated, problems that develop following injury can persist for months, even years. It has been well documented that persistent cognitive and behavior problems can negatively affect a student's chance of achieving academically and socially. Unfortunately, little research that looks at the effectiveness of various interventions with this population has been conducted. Although Michaud, Duhaime, and Batshaw (1993) concluded that data are not presently available to allow the design and implementation of effective school-based intervention programs, the present authors disagree.

There are scant data to support the use of specific interventions with TBI populations, but behavioral research has yielded a substantial amount of scientifically based information regarding the management of children who have similar behavior problems. Besides, the interventions that are currently available are not precise enough to treat students who exhibit behavioral disturbances as a result of TBI differently from those who exhibit such behaviors due to other causes. The use of behavioral treatments that address both antecedents and consequences of behaviors and take into consideration a student's cognitive strengths and weaknesses may be a reasonable first step. This may mean that cognitive interventions have to be implemented at the same time that other behavioral management strategies are being used. If behavioral and/or cognitive strategies prove to be ineffective, then the next step would be to consider use of adjunctive medication therapies.

ABOUT THE AUTHORS

***Thomas J. Kehle**, PhD, is a professor and director of the School Psychology Program at the University of Connecticut. His research interests are in self-modeling interventions. **Elaine Clark**, PhD, is an associate professor and director of the School Psychology Program at the University of Utah. Dr. Clark*

conducts research in the area of traumatic brain injury and serves on the Child and Adolescent Task Force of the National Head Injury Foundation. ***William R. Jenson****, PhD, is a professor and chair of the Department of Educational Psychology at the University of Utah. His research interests are in the management of students with severe behavioral disturbances, practical classroom behavior management, behavioral assessment, academic interventions, and parent training. Address: Thomas J. Kehle, Department of Educational Psychology, U-64, University of Connecticut, Storrs, CT 06269.*

REFERENCES

Asarnow, R. F., Satz, P., Light, R., & Lewis, R. (1991). Behavior problems and adaptive functioning in children with mild and severe closed head injury. *Journal of Pediatric Psychology, 16*, 543–555.

Bandura, A. (1986). *Social foundations of thought and action: A social-cognitive theory.* Englewood Cliffs, NJ: Prentice-Hall.

Begali, V. (1992). *Head injury in children and adolescents: A resource and review for school and allied professionals.* Brandon, VT: Clinical Psychology Publishing.

Bijur, P.E., Haslum, M., & Golding, J. (1990). Cognitive and behavioral sequelae of mild head injury in children. *Pediatrics, 86*, 337–344.

Brown, G. W., Chadwick, O., Shaffer, D., Rutter, M., & Traub, M. (1981). A prospective study of children with head injuries: 3. Psychiatric sequelae. *Psychological Medicine, 11*, 63–78.

Capruso, D., & Levin, H. S. (1992). Cognitive impairment following closed head injury. *Neurology Clinics, 10*, 879–893.

Casey, R., Ludwig, S., & McCormick, M. C. (1986). Morbidity following minor head trauma in children. *Pediatrics, 78*, 497–502.

Clark, E., Baker, B. K., Gardner, M. K., Pompa, J. L., & Tait, F. V. (1990). Effectiveness of stimulant drug treatment for attention problems. *School Psychology International, 11*, 227–234.

Cope, D. N. (1987). Psychopharmacologic considerations in the treatment of traumatic brain injury. *Journal of Head Trauma Rehabilitation, 2*, 2–5.

Dalby, P. R., & Obrzut, J. E. (1991). Epidemiologic characteristics and sequelae of closed head–injured children and adolescents: A review. *Developmental Neuropsychology, 7*(1), 35–68.

Deaton, A. V. (1994). Changing the behaviors of students with acquired brain injuries. In R. C. Savage & G. F. Wolcott (Eds.), *Educational dimensions of acquired brain injury* (pp. 257–276). Austin, TX: PRO-ED.

Dempster, F. N. (1988). The spacing effect: A case study in the failure to apply the results of psychological research. *American Psychologist, 43*, 627–634.

Di Scala, C., Osberg, J. S., Gans, B. M., Chin, L. J., & Grant, C. C. (1991). Children with traumatic head injury: Morbidity and postacute treatment. *Archives of Physical Medicine and Rehabilitation, 72*, 662–666.

Donders, J. (1992). Premorbid behavioral and psychosocial adjustment of children with traumatic brain injury. *Journal of Abnormal Child Psychology, 20*, 233–246.

Fay, G. C, Jaffe, K. M., Polissar, N. L., Liao, S., Martin, K. M., Shurtleff, H. A., Rivara, J. M., & Winn, H. R. (1994). Mild pediatric traumatic brain injury: A cohort study. *Archives of Physical Medicine and Rehabilitation, 74*, 895–901.

Fletcher, J. M., Ewing-Cobbs, L., Miner, M. E., Levin, H. S., & Eisenberg, H. M. (1993). Behavioral changes after closed head injury in children. *Journal of Consulting and Clinical Psychology, 58*, 93–98.

Foxx, R. M., & Shapiro, S. T. (1978). The time-out ribbon: A non-exclusionary time-out procedure. *Journal of Applied Behavior Analysis, 11*, 125–136.

Franzen, M. D., & Lovell, M. R. (1987). Behavioral treatments of aggressive sequelae of brain injury. *Psychiatric Annals, 17*, 389–396.

Glenn, M. B. (1987a). A pharmacological approach to aggressive and disruptive behaviors after traumatic brain injury: Part 1. *Journal of Head Trauma Rehabilitation, 2*, 71–73.

Glenn, M. B. (1987b). A pharmacological approach to aggressive and disruptive behaviors after traumatic brain injury: Part 2. *Journal of Head Trauma Rehabilitation, 2*, 80–81.

Greenspan, A. I. & MacKenzie, E. J. (1994). Functional outcome after pediatric head injury. *Pediatrics, 94*, 425–432.

Haas, J. F., & Cope, N. (1985). Neuropharmacologic management of behavior sequelae in head injury: A case report. *Archives in Physical Medicine Rehabilitation, 66*, 472–474.

Heller, M. S., & White, M. A. (1975). Rates of approval and disapproval to higher and lower ability classes. *Journal of Educational Psychology, 67*, 769–800.

Jaffe, K. M., Fay, G. C., Polissar, N. L., Martin, K. M., Shurtleff, H., Rivara, J. B., & Winn, H. R. (1993). Severity of pediatric traumatic brain injury and early neurobehavioral outcome: A cohort study. *Archives of Physical Medicine and Rehabilitation, 73*, 540–547.

Kehle, T. J., Clark, E., Jenson, W. R., & Wampold, B. E. (1986). Effectiveness of self-observation with behavior disordered elementary school children. *School Psychology Review, 15*, 289–295.

Kehle, T. J., & Gonzales, F. (1991). Self-modeling for emotional and social concerns of childhood. In P. W. Dowrick (Ed.), *A practical guide to video in the behavioral sciences* (pp. 221–252). New York: Wiley.

Kehle, T. J., Jenson, W. R., & Clark, E. (1992). Teacher acceptance of psychological interventions: An allegiance to intuition? *School Psychology International, 13*, 307–312.

Kehle, T. J., Sutilla, H., & Visnic, M. (1994, March). *Augmentation of self-modeling with behavioral strategies: Case study of an intentional enuretic and electively mute child.* Paper presented at the annual meeting of the National Association of School Psychologists, Seattle, WA.

Knights, R. M., Ivan, L. P., Ventureyra, E. C., Bentivoglio, C., Stoddart, C., Winogron, W., & Bawden, H. N. (1991). The effects of head injury in children on neuropsychological and behavioural functioning. *Brain Injury, 5*, 339–351.

Levin, H. S. (1987). Neurobehavioral sequelae of head injury. In P. R. Cooper (Ed.), *Head injury* (2nd ed.). Baltimore: Williams and Wilkins.

Malec, J. (1984). Training the brain-injured client in behavioral self-management skills. In B. A. Edelstein & E. T. Couture (Eds.), *Behavioral assessment and rehabilitation of the traumatically brain damaged* (pp. 121–150). New York: Plenum.

Mapou, R. L. (1992). Neuropathology and neuropsychology of behavioral disturbance following traumatic brain injury. In C. L. Long & L. K. Ross (Eds.), *Handbook of head trauma: Acute care to recovery* (pp. 75–90). New York: Plenum.

McAllister, T. W. (1992). Neuropsychiatric sequelae of head injuries. *Psychiatric Clinics of North America, 15*, 522–534.

McKinlay, W. W., Brooks, M. R., Bond, M. R., Martinage, D. P., & Marshall, M. M. (1981). The short term outcome of severe blunt head injury as reported by relatives of the injured patients. *Journal*

of Neurology, Neurosurgery and Psychiatry, 48, 527–533.

Michaud, L. J., Duhaime, A., & Batshaw, M. L. (1993). Traumatic brain injury in children. *Pediatric Clinics of North America, 40*, 553–565.

Michaud, L. J., Rivara, F. P., Jaffe, K. M., Fay, G., & Dailey, J. L. (1993). Traumatic brain injury as a risk factor for behavioral disorders in children. *Archives of Physical Medicine Rehabilitation, 74*, 368–375.

Reavis, H. K., Jenson, W. R., Kukic, S. J., & Morgan, D. P. (1993). *Utah's BEST project: Behavioral and educational strategies for teachers*. Salt Lake City: Utah State Office of Education.

Rhode, G., Jenson, W. R., & Reavis, H. K. (1993). *The tough kid book: Practical classroom management strategies*. Longmont, CO: Sopris West.

Rose, M. J. (1988). The place of drugs in the management of behavior disorders after traumatic brain injury. *Journal of Head Trauma Rehabilitation, 3*, 7–13.

Rosenthal, M., & Bond, M. R. (1990). Behavioral and psychiatric sequelae. In M. Rosenthal, M. Bond, E. R. Griffith, & J. D. Miller (Eds.), *Rehabilitation of the adult and child with traumatic brain injury* (pp. 179–192). Philadelphia: Davis.

Shutte, R. C., & Hopkins, B. L. (1970). The effects of teacher attention on following instructions in a kindergarten class. *Journal of Applied Behavior Analysis, 3*, 117–122.

Siassi, I. (1982). Lithium treatment of impulsive behavior in children. *Journal of Clinical Psychiatry, 45*, 482–484.

Silver, J. M., & Yudofsky, S. C. (1987). Aggressive behavior in patients with neuropsychiatric disorders. *Psychiatric Annals, 17*, 367–370.

Thomas, D. A., Becker, W. C., & Armstrong, M. (1968). Production and elimination of disruptive classroom behavior by systematically varying teachers' behavior. *Journal of Applied Behavior Analysis, 1*, 35–45.

Tompkins, C. A., Holland, A. L., Ratcliff, G., & Costello, A. J. (1990). Predicting cognitive recovery from closed head injury in children and adolescents. *Brain and Cognition, 13*(1), 86–97.

Van Houten, R., & Doley, D. M. (1983). Are social reprimands effective? In S. Axelrod & J. Apsche (Eds.), *The effects of punishment on human behavior* (pp. 45–70). New York: Academic Press.

Van Houten, R., Nau, P., MacKenzie-Keating, D., Sameoto, D., & Calavecchie, B. (1982). An analysis of some variables influencing the effectiveness of reprimands. *Journal of Applied Behavior Analysis, 15*, 65–83.

White, M. A. (1975). Natural rates of teacher approval and disapproval in the classroom. *Journal of Applied Behavior Analysis, 8*, 367–372.

Wood, R. L. (1987). *Brain injury rehabilitation: A neurobehavioral approach*. Rockville, MD: Aspen.

Yudofsky, S. C., Silver, J. M., & Schneider, S. E. (1987). Pharmacological treatment of aggression. *Psychiatric Annals, 17*, 397–404.