

Differential Reinforcement for the Treatment of Traumatic Brain Injury

Name

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Traumatic Brain Injury (TBI) is a condition that often results in unwanted behaviors, which may not manifest until several weeks or months after the injury occurred. Aside from behavioral issues, TBI patients often also experience physical, psychosocial, cognitive, and functional issues (Alderman, 2003). The populace was not likely familiar with TBI as a widely used diagnosis until the last two decades. TBI awareness increase is partly due to the media exposure associated with TBI as a result of military service in combat following wartime campaigns in Iraq and Afghanistan, and a large number of veterans diagnosed as such reintegrating back into the civilian population. There are a wide range of symptoms associated with TBI, to include concentration and memory, fatigue, depressed mood, and irritability. Although these symptoms can also occur as part of with post-concussion syndrome (PCS), PCS is often expressed more immediately following the incident are headache, dizziness, and sensitivity/intolerance to noise (Alderman, 2003). Of all of these symptoms, irritability is the most persistent and is causal for many behavioral issues prevalent with children and adults suffering from TBI. Irritability is “a feeling state characterized by reduced control over temper which usually results in irascible verbal or behavioral outbursts” (Snaith & Taylor, 1985), or, “a tendency to react impulsively, controversially, or rudely at the slightest provocation or disagreement” (Caprara et al. 1985). Irritability can be a particularly crippling lasting side effect of TBI because it affects the way the TBI patient receives the world; their interpersonal interactions with others, the way they interpret the intent of others, and ultimately the reaction to situations and stimuli. Researchers that consider these signs and symptoms, and credit them as being attributable to TBI on a long-term scale, are considered contemporary and non-traditional.

Although perhaps contemporary in the respect that differential reinforcement behavior shaping is considered a potential solution in lieu of medications, this treatment itself is not a revolutionary methodology. The application of differential reinforcement behavior shaping to TBI side effects, especially irritability, has been a topic of research because the persistence of the side effect and the extent to which the side effect can affect the quality of life for the post-TBI subject (Slifer & Amari, 2009).

Traumatic Brain Injury, such as open head, closed head, and blast force trauma, is defined as an event or process which falls under the umbrella of acquired brain injury (ABI). ABI also includes events or processes such as brain infections (encephalitis), tumors (and the surgery/treatment such as radiation), hypoxia, and stroke (Slifer & Amari, 2009). Traumatic Brain Injury is prominent in those involved in automobile accidents, and blast force trauma in combat-related events. Irritability and aggression are among the most undesirable of the symptoms associated with TBI, and for some people exist for years following the event. In spite of a successful healing process for the neurological aspect of the brain, many adults experience aggression, which is consistently linked to depression and overall low level of satisfaction with life. TBI of course ranges from mild to severe, aggression persisting for up to a year in mild cases and up to 5 years for the most severe cases, (Ylvisaker, 2007). This raises logical concerns for the post-TBI adult attempting to reintegrate back into their communities, their families, their relationships. one such study identified loss of emotional control (LEC, including impulsiveness, aggression, irritability and frequent mood changes) as a critical predictor of poor community integration on average 8.8 years post-injury (Winkler, 2006). Many healthcare professionals overlook this dimension of TBI symptoms, and as a result fail to prepare for transition back into

the TBI patient's respective community. Eight years is an astonishing length of time for an adult to experience difficulties integrating back into the communities from which they were accustomed. These difficulties can forever alter the quality of life for the TBI patient and affect the choices made by that person. It is likely that TBI symptoms often result in irreparable damage that can cause alienation from children, family, and friends, lead to divorce, or even change the ability or willingness to perform jobs or professions.

Treatment for TBI is typically most effective if the treatment is as unobtrusive as possible, administered for the shortest time possible, and emphasizes skill building. This line of thinking works towards prevention of adverse reactions that may occur during behavior modification techniques that involve punishment or traditional reinforcement. For instance, because cognitive function may be impaired and is often accompanied by irritability/aggression, the use of punishment could incite hostility towards the therapist or staff, or result in generalized suppression. Sometimes the TBI patient already possesses coping skills and mechanisms that simply need to be modified or strengthened to accommodate the patient in their TBI event state. Differential reinforcement methods are the preferred method for this treatment, and consist of three main variations: differential reinforcement of incompatible behavior (DRI), differential reinforcement of other behavior (DRO), and differential reinforcement of low levels of responding (DRL). Differential reinforcement of incompatible behavior is sometimes referred to as differential reinforcement of alternative behavior (DRA), and involves the reinforcement of a behavior that is directly incompatible with the undesirable behavior (Alderman & Knight, 1997). Differential reinforcement of incompatible/alternative behavior seems to be most widely used. For instance, if the TBI patient is exhibiting an undesirable behavior of becoming verbally

aggressive when discussing the TBI event, a therapist could use fixed-interval reinforcement in the form of social attention when the patient speaks about the event in a calm manner, and making the social attention unavailable if the patient engages in the undesirable behavior. The behavior of being calm while discussing the event is directly incompatible with being verbally aggressive, ideally transforming the incompatible/alternative behavior into the desirable, reinforced behavior. Once the patient displays the alternative behavior consistently over some period of occurrences, the therapist should scale back the delivery of the social reinforcement until the behavior is solidified into the patient's skill set to cope with their TBI state. Another appropriate variant is differential reinforcement of other behavior, which could be used in lieu of DRI/DRA because the undesirable behavior may not necessarily have a truly incompatible behavior. In applying DRO a therapist/staff simply provide reinforcement for positive or constructive behaviors, which should cause a decrease in the undesirable behavior. For instance, if the undesirable behavior is depressed mood, it is difficult to find a behavior that is directly incompatible. In this case, an effective treatment may include identifying a positive or constructive behavior that the TBI patient enjoys, and employ variable interval reinforcement schedule for the desired behavior. The assumption is that with the increase of the desired behavior, the undesirable behavior of depressed mood will decrease. Another variant of differential reinforcement is DRL, which is more commonly used with children or severe TBI cases, when an undesirable behavior is so frequent that it interferes with other forms of behavior modification or treatments. This process is used to decrease the frequency with which the patient engages in the undesirable behavior, using a reinforcement

schedule that delivers a reinforcer when the patient engages in the behavior at or below a pre-determined baseline level over a period of time.

Differential Reinforcement consists of planning preferential items or events (to include social attention) to be available in an effort to increase the occurrence of a type of alternative behavior, which will be conducive to treatment of TBI symptoms (Slifer & Amari, 2009). This approach to behavior modification is essential for the therapist to develop a soothing, mental and physiological healing process that is supportive and non-judgemental. The therapist or staff encourages communication with professionals and participate in and take ownership of the treatment process, education and integration. A key consideration during the treatment is that TBI patients may learn differently than non-TBI people, and even their former selves. Therapists or staff must present tasks and challenges in a way that is an acceptable level of exertion to prevent the TBI patient from wanting to quit, and providing positive reinforcement for even the smallest amount of improvement. A key component of the treatment, especially in the time immediately following the event, are antecedent management interventions. Antecedent management interventions include systematic assessments of the environment and the contributing factors to the internal state of the TBI patient's undesirable behaviors (Slifer et al., 2009). Similar interventions may also be targeted at the TBI patient's psychological state by treating anxiety, anger, and depressed mood, which are surely associated with negative or undesirable behaviors. A root cause of many of those undesirable behaviors is irritability, which induces aggression and unpredictable behavior. The purpose of this antecedent management approach is to decrease the likelihood of behaviors that are dangerous to the patient or the

patient's emotional or mental well-being. This is only effective until the TBI patient recovers previous levels of cognitive functioning, or compensatory functions to unwanted behaviors.

The connection between differential reinforcement and symptoms of TBI is not always obvious to the TBI patient. Perhaps a key element that is often not discussed in academic journals is the communication process that is required for treatment to be successful. TBI is a unique diagnosis in the sense that it is difficult to see to the outside observer; this element of TBI is often stressful for those experiencing the symptoms and aftermath because it is difficult at times to explain to someone who is not familiar with TBI and its ramifications. As if that was not frustrating enough, the time following the TBI event is uncertain, as is any event that affects the brain. Some TBI patients experience mild symptoms, or no apparent symptoms at all, where some TBI patients experience intense and confusing symptoms for which they are not prepared! As an adult that experienced TBI from a blast force trauma event myself, I feel that I have unique insight into the struggle to reclaim identity after a TBI event. Reading and analyzing the materials for this topic I am often emotionally affected, recalling my own experiences with the late development of many of the symptoms associated with TBI. Most of the recovery from TBI occurs in the first 12 months after the TBI event, meaning that for most TBI patients spend some or all of that crucial period of time receiving very little care, inappropriate care, or none at all (Manchester et al., 2007).

In my particular circumstance, my TBI event occurred in a designated combat zone in Afghanistan in November 2012, and I spent 3 days inpatient at a TBI Clinic in Afghanistan, followed by 7 days of outpatient treatment. That clinic was located on a major United States controlled base, and my TBI care was administered by a United States Army Captain, who was

by trade a Doctor of Orthopedic Medicine. Despite her compassion and enthusiasm for the TBI clinic, she simply was not well-trained to rehabilitate traumatic brain injuries. My rehabilitation included a prescription to rest as much as possible and avoid unnecessary stress, while physically located on a base that was infamous for receiving daily effective enemy rocket attacks. Needless to say, I did not feel that sirens and frequent visits to bunkers were exactly conducive for my condition. The instrument used to measure my ability to return back to normal duty included being able to walk a brisk pace while wearing body armor for 5 minutes without extreme dizziness or optical disturbances (seeing spots, fuzzy field of vision), and manageable headache pain. I was prescribed an anti-inflammatory medication, and a sleep aid medication. Once I returned to work, I realized that my cognitive function was extremely impaired. I experienced impaired speech for about 14 days, generalized irritability, aggression, impulsivity, and disinhibition. I was not acting like myself, and had a very difficult time integrating back into the unstable environment of a combat zone. I spent the first five months immediately following my TBI event in a hostile combat zone, and the lasting effects are prevalent in my everyday life, many months later. It has affected my interpersonal relationships and forever altered my professional life. Reflecting back to the event and the aftermath, and considering my increased knowledge on the topic of TBI and behavioral modifications in general, I realize that I suffered from severe disinhibition and impulsivity immediately following my TBI event. What happened next was the most unnerving; my transition from deployment in a combat zone was happening, simultaneously with my transition back to the civilian world after 12 years of active duty military service, coupled with lingering irritability and aggression as TBI symptoms. Unfortunately for me, and many other TBI patients, the CDC states that each year an estimated 80,000 to 90,000

people with TBI experience permanent disability from their injury (13, 2004). None of the CDC data included numbers from federal, military, or veterans hospitals (49, 2004). I can see how differential reinforcement would have likely helped me to overcome my challenges associated with TBI; I feel very strongly that had I even been aware of the concepts and their application for TBI it would've benefited me in recognizing my symptoms and overcoming them in a healthy manner. The CDC recognizes that "Traumatic brain injury (TBI) is an important public health problem in the United States", and "because awareness about TBI among the general public is limited, it is frequently referred to as the 'silent epidemic.'" (3, 2004). I believe that with continued media attention, more research, and data from organizations such as the federal, military, and veterans hospitals, people will be more aware of the ramifications of not seeking treatment after suspected traumatic brain injuries.

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