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*Corresponding author

K. Daniel O'Leary, Department of Psychology, Stony Brook University, Stony Brook, NY 11974-2500, USA

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Key Words

Traumatic brain injury; Hospitalization; Divorce; Problem-solving; Marital therapy

Abbreviations

TBI: Traumatic Brain Injury; PCRS: Patient Competency Rating Scale; TCI: Therapeutic Couples Intervention

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Review Article

Needed: Relationship and Problem-Solving Treatment Trials for Men with Traumatic Brain Injury

K. Daniel O'Leary* and Habibat Ighile

Department of Psychology, Stony Brook University, USA

Abstract

In developed countries, Traumatic Brain Injury (TBI) affects approximately 12% of adults, and men are significantly more likely to sustain a TBI than women. Data are presented that document the differential adverse impact of TBI on hospitalization and death rates of men. Data are also presented on the differential effects of TBI on intimate relationships of men and women with a special focus on marital dissolution. Two large national studies in the US showed that the divorce rates of men are markedly higher for men than women. TBI should be conceptualized as a disease that affects families for it has long been known that caregivers carry a significant burden and suffer their own depression, anxiety, and relationship discord. A conceptual analysis of the treatment outcome literature with TBI patients and their caregivers led us to the concerning conclusion that there is a crucial need for treatment outcome trials with both patients and caregivers. Promising emerging evidence from controlled trials suggests that problem-solving therapy and relationship therapy with TBI patients and their caregivers should be treatment priorities with replications and extensions.

Introduction

Traumatic Brain Injury (TBI) is a disruption in brain function caused by an external force. Based on a meta-analysis of 15 studies from developed countries with over 25,000 adults, 12% had a history of TBI [1], and men are more adversely affected by TBI. Given this differential impact, this manuscript has four goals:

- i. To document the differential hospitalization and mortality rates of TBI for men and women;
- ii. To discuss the differential impact of TBI on men and women with a special focus on marital dissolution and sexual dissatisfaction;
- iii. To provide a conceptual and concerning analysis of the treatment of patients with TBI and caregivers;
- iv. To discuss promising problem-solving and relationship therapies for patients with TBI and their caregivers and to call for treatment outcome research on such.

Before addressing the above goals, some basic information is presented about TBI. Liossi & Wood [2] documented that TBI has two peak occurrence periods, ages 20-30 and 70-90, and the odds of a TBI resulting in loss of consciousness are 2.2 times higher for men than women in developed countries [1]. According to the Centers for Disease Control and Prevention [3], mild TBI refers to transient confusion and disorientation, memory dysfunction at the time of the injury, other neurological dysfunctions, and loss of consciousness lasting less than 30 minutes. Some persons with mild TBI experience rapid symptom resolution whereas others continue to evidence symptoms for an extended duration. Moderate and severe head injuries result in more consistent patterns of disability following injury. "In general, patients who sustain moderate to severe head injury tend to experience persistent and extensive neuropsychological, psychiatric, and occupational impairment...These health problems have been described as being similar to the effects of chronic disease" [3].

Giordano et al. [4] argued that binary categories of male and female are not sufficient to guide clinical decisions for neurotrauma, and they called for incorporation of gender beyond the binary in TBI education, research, and clinical care. However, they also noted that most existing TBI outcome research is stratified in binary male and female categories, and all reviews have to rely largely on the existing binary categorizations. The need to go beyond binary categories is evident in part because of the increased likelihood of violence and severe physical victimization in both gay men and lesbian women when compared to their heterosexual counterparts [5]. Moreover, in a transgender survey of 28,000 participants, 9% experienced physical violence in the past year due to their gender and 24% experienced severe physical violence which likely involved injuries to the head and neck [6]. As will be discussed later in this manuscript, hormonal levels offer some protection in recovery from TBI, and thus non-binary research on recovery from TBI in concert with hormonal assays would be important lines of inquiry. Such research seems especially important given the beneficial effect of progesterone treatment on functional independence and mortality of patients with severe TBI [7].

Differential Hospitalization and Mortality of TBI in Men and Women

According to the Centers for Disease Control and Prevention, in 2017 men were more likely to have TBI-related hospitalizations than women with especially larger rates for men than women due to motor vehicle accidents [8]. There were smaller differences in TBI hospitalizations due to falls though males still had higher rates than women and falls account for the largest number of hospitalizations of any of the principal mechanism categories associated with TBI. Males also had higher numbers of deaths from TBI than women, and TBI survivors have a lower life expectancy than individuals in the general population [8]. Greenwald et al. (2015) showed that moderate to severe TBI patients who received inpatient rehabilitation had a life expectancy loss of 6.6 years.

Differential Impact of TBI on Psychological & Divorce Rates of Men and Women

Psychological functioning

Gupte et al. [9], in a review of sex differences in TBI, emphasized that there are too few studies of TBI in females to reach definitive conclusions, and the conclusions reached vary by sample size in the study. With 15 large studies of 10,000 or greater, participants' better outcomes were reported for women than in studies with smaller numbers of participants. The large studies using national registers had dependent measures reflecting community integration and survival. In 118 small studies (0-1,000), where women did worse than men, the dependent measures were more likely about socio-behavioral functioning. In short, how men and women fare post-TBI relates in part to the sample size and the dependent measures being assessed. However, Gupte et al. [9] concluded that "Because larger sample size affords greater statistical power and



might better represent the general population, these large studies might be more reliable predictors of sex differences in TBI outcomes" (p. 3083). Kirkness et al. [10] showed that women less than 30 years of age had significantly better outcomes on two measures of global functioning regarding daily living than either males or older females, and that women over 30 had no improvement after 3-6 months on global functioning following a moderate TBI. Hormonal neuroprotection has been cited to be a factor that contributes to more favorable outcomes in younger women with moderate to severe TBI, especially when considering the neuroprotective role of progesterone [11], which tends to be more in abundance in such women. Animal studies have been utilized to try to understand the differential recovery between males and females with TBI. These studies have been consistent in showing that female mice and rats with TBIs fare better than male counterparts due to the neuroprotective factor that their hormones, estrogen and progesterone, provide [12]. Returning to the suggestion of Giordano et al. [4] and the need to move beyond binary classifications of male and female, it would seem theoretically quite useful to examine recovery from TBI in various sexual minority samples and samples where hormonal therapy was evident. In such groups, the potential neuroprotective effect of progesterone could be examined, an effect which has been demonstrated in both human and animal samples.

Men post-TBI have much greater impairment than women when it comes to self-awareness of the injury [11,13]. Using 121 patients with moderate or severe TBI undergoing acute rehabilitation at a level 1 trauma center, Niemeier et al. [11] showed that women had better awareness of their injury-related deficits at acute rehabilitation discharge, even after controlling for age, education, and injury severity. This lack of awareness of one's post-injury outcomes plays a role in why men are more likely to suffer from TBI than women on some dimensions. For women, being able to understand their outcomes and express understanding of their outcomes, allows them to pinpoint issues they might be facing and thus seek help to resolve or mediate the problem. Perhaps not surprisingly, women are more likely to report post-TBI symptoms than males. Further, women have been shown to have a higher likelihood of reporting symptoms in other diseased states as well. For example, as shown by Bazarian et al. [12], women with coronary artery disease, hypertension, and musculoskeletal disorders report more symptoms than their male counterparts. In contrast, men who lack the awareness of their post-TBI outcomes are less likely and/or are unable to express issues they might be facing. In turn, they may not see it as necessary to seek help to address their problems. Based on the results of the patient-family discrepancy scores on the Patient Competency Rating Scale (PCRS), Niemeier et al. [11] found a significant difference between men and women on self-awareness of their TBI deficits at the time of patient discharge from a hospital setting. Therefore, it is important to understand the underlying reason for this self-awareness difference and to find ways to encourage men to pay closer attention to their symptomatology to minimize strain and improve their quality-of-life post-TBI.

It is important to understand that the impact of TBI is not uniform across dependent measures of post-TBI functioning, as social and psychological factors can influence men and women differently. For example, in a sample of patients with moderate to severe TBI, women were more likely to decrease hours or stop working than men, except in the oldest age group (55-64yrs) in which men were more likely to stop working [14]. The researchers also noted that return to work may be harder for some women post-TBI as women are much more likely to have TBI as a function of partner abuse. For example, with a sample of women in shelters or completing a protection order, Valera & Berenbaum [15] found that 74% of the women had a TBI. The lack of consistent differences between males and females on different dependent measures was also seen in the research of Bazarian et al. [12], who had a sample of 1425 subjects with primarily moderate TBIs. The men and women were shown to have the same activity levels, (i.e., # of days worked, and # of days to return to normal activities) following a TBI. However, the women had poorer post-TBI activity level coping mechanisms regarding their jobs, thus reporting more symptoms than men [12]. These results were interpreted as being due in part to the fact that many men, being the primary wage workers, return to work because of societal pressure and the necessity to maintain their masculine role. The pressure to return to work is felt more acutely by men, and they do return to work more than women [14]. The complex interplay of factors relating to recovery is also illustrated by the failure to find gender differences in the trajectories of life satisfaction of 3157 individuals with moderate to severe TBI across a decade while at the same time showing that cognitive and motor abilities were important predictors of life satisfaction [16].

Intimate relationship functioning and divorce

Problems in maintaining intimate relationships are among the most frequently reported TBI sequelae [17]. In a sample of mild and moderate-severe TBI patients and spouses recruited from rehabilitation centers and neuropsychology referrals, 52% of the TBI patients and 50% of their partners reported clinically-significant relationship distress post-injury [17]. In an analysis of short-term effects of TBI on relationship functioning, Bannon et al. [18] showed 1-month ratings of mild TBI symptoms demonstrated significant cross-sectional associations with romantic relationship satisfaction, while controlling for retrospective ratings of satisfaction prior to injury. Further, greater initial mild TBI symptoms were also related to decreases in relationship satisfaction 1-month post-injury. The adverse impact of TBI on stability of marriage 2 years post-TBI was documented in a nationwide sample of

977 individuals drawn from 16 Model System Centers [19]. The patients had moderate to severe TBI. Marital stability was dichotomously scored as stable (married at admission and married at follow up years 1 and 2) or unstable (separated, divorced, single). The odds of being unstably married were 1.95 times greater for males than females. Stably married individuals comprised 85% of the sample; 15% had separated or divorced. A racial/ethnicity variable was examined in a binary fashion without further breakdown. Twenty percent of minorities (African-American, Hispanic, Asian, & Native American) were unstably married compared to 13% of Caucasians, a significant difference. The odds of being unstably married vs. stably married were 1.72-times greater for minorities than for Caucasians.

Turning to a longer follow-up interval post TBI, a ten-year follow-up of 1423 patients showed that 66% of the individuals with TBI remained married across a ten-year period following the TBI [20]. However, males had a 75% rate of dissolution compared to 25% for females, and instability was highest in the first-year post injury. These rates of dissolution for men with TBI are far greater than rates of dissolution for men in the general population [21], and suggest the need for psychoeducational programs shortly after the TBI with some special attention to relationship functioning and the critical need for such programs for men. Given the disproportionate rate of marital dissolution for men and the fact that there is very ample empirical support for several different marital/relationship therapies [22,23], we suggest there should be empirical trials of such therapies with TBI men. Confirming the increased risk for divorce for TBI patients, Norup et al. [24] used a national population-based register study in Denmark with follow-up assessments. Their participants included 18,327 TBI patients who had been admitted to a hospital or an emergency room and these individuals were compared to a matched control group of 135,325 individuals. They extracted data on marital status from 1 year before the TBI until 5 years after the TBI. Only people who were married in the year before the injury were included. The researchers found that there was an increase in risk for divorce for patients with TBI compared with controls for all five years post TBI. The adjusted odds ratio of divorce during the first three years post TBI was 1.44 for patients compared to controls and it increased across the years. This study on divorce with TBI patients is especially important as other studies with TBI patients have not used matched controls. While it did not examine the possible differential risk of divorce for men and women, the study is important as it is the first large follow-up study with a matched control group.

These divorce rates of TBI patients can be contextualized in part with repeated findings that following TBI men and women often have significant rates of sexual dissatisfaction [25]. More specifically, Sander et al. [25] had a sample of 223 patients who had been treated at TBI Model Systems inpatient rehabilitation units but at assessment were living in the community. Women scored below a normative sample on all four scales of the Derogatis Sexual Inventory given to the patients and men scored lower on all but the arousal scale. Moreover, approximately 30% of the men and women reported overall sexual dissatisfaction. In a parallel study, Sander et al. [26], evaluated 70 patients and their partners who were seen at the TBI Model Systems inpatient unit assessed 1 year after their injury and living in the community. Twenty percent of spouses/partners of persons with TBI reported sexual dysfunction, and 44% reported dissatisfaction with sexual functioning. Not surprisingly, the sexual functioning of spouses/partners of persons with TBI was highly associated with the sexual functioning of the person with TBI. Fraser et al. [27] replicated earlier findings that 84 individuals with TBI but living in the community and assessed approximately 3 years post-injury had significantly worse scores on sexuality, mood, and self-esteem than 88 control participants. Of note, using multiple regression, older age, greater depression, and lower self-esteem were significant predictors of poorer sexuality post-injury.

A Conceptual and Concerning Analysis of Treatments for Patients with TBI and their Caregivers

Baker et al. [28] conducted a systematic review of interventions to support TBI caregivers with studies conducted from 1990 to 2015. In short, using 62 studies with reported caregiver outcomes for the traumatic brain injury cohort, 51 reported negative outcomes and 11 reported positive outcomes. The preponderance of these negative results leads us to argue that there is a critical need for treatment outcome studies with caregivers. Despite the negative outcomes in this review, it illustrated how caregiver needs have significant effects on TBI outcomes and why they clearly need assistance [29]. However, of interest, in accord with our own position herein, problem-solving therapy was recommended by Baker et al. [28] as a particularly promising intervention with these caregivers. Following the review of Baker et al. [28], we note two more recent treatment studies that illustrate some positive treatment effects, but they also illustrate the challenges of documenting empirically supported TBI treatments. A randomized controlled trial evaluating the effects of a 5-session manualized intervention for family members illustrates the difficulties in facilitating positive changes in caregivers of patients primarily composed of moderate to severe TBI patients [29]. Caregivers were taught skills involving problem solving, communication, and advocacy. They were also given psychoeducation about common consequences of TBI, and they were taught how to identify progress. The caregivers of the control patients received five packets of educational materials unrelated to the inpatient intervention (newsletter articles and fact sheets related to TBI). There were four primary dependent measures: met needs for emotional, instrumental, and professional support and brain injury knowledge.



Caregivers in the treatment group showed a significant increase in met needs on all four measures, but the caregivers in the treatment group only showed greater changes than the control group on emotional support needs. Moreover, the gains were not maintained at three-month follow-up. Thus, while promising, treatment efforts may have to be broader in coverage and more intensive.

The utility of family involvement in TBI treatment was well illustrated in a multisite evaluation of the effects of family attendance at inpatient rehabilitation sessions with 1835 patients on outcome at discharge and up to 9 months post discharge [30]. Patients whose family members were in attendance 10% or more of the sessions were significantly more likely to "be out and about in their communities" at 3 and 9-months post discharge than patients whose family members attended less than 10% of the treatment time. Moreover, functional independence in cognitive areas was positively associated with family participation, and the authors recommended that rehabilitation teams should encourage family participation in the rehabilitation process. In summary, consistent with a theme in this manuscript, there are clear needs to evaluate relationship and family treatments for TBI. Now let us turn to psychosocial treatments for patients with TBI. Psychoeducational interventions for patients with mild TBI were reviewed by Comper et al. [31] who evaluated seven informational interventions in which patients were provided with reassurance, expected recovery times, and strategies for mild TBI symptom management. In most studies, the educational intervention was compared to usual hospital services. The general conclusion was that psychoeducation and support was effective in reducing somatic and psychological complaints.

Bergersena et al. [32] systematically reviewed the recent literature on psychotherapeutic interventions aimed at prolonged symptoms of patients after mild traumatic brain injury. The main finding was that few studies have been conducted and the overall methodological quality is sub-optimal. It is, therefore, premature to make strong clinical recommendations for psychological treatment of prolonged symptoms following mild TBI. There is an urgent need for methodologically sound clinical trials to inform clinical practice. Given the complex nature of mechanisms associated with prolonged symptoms following mild TBI, this should be a multidisciplinary collaborative effort.

Couple and Problem-Solving Therapy for TBI Patients and their Family Members

It is important to address the elevated levels of depression in TBI patients, both directly and indirectly, as it has been shown that psychological treatment of couples with a wife with comorbid depression and relationship discord leads to decreases in depression symptomatology and increases relationship satisfaction [33,34]. Moreover, a randomized control trial with five 2-hr treatment sessions with a depressed wife and her partner intended to help the husband learn about depression and how to support his wife led to decreases in depression of the wife and reduction in caregiver stress and depression-specific burden of the husband. Sixty-seven percent of women in the couple treatment group improved at post treatment and 47% recovered at follow-up compared to only 17% improved and 8% recovered in the control group [35]. The value of using a couple intervention for TBI patients and their partners was demonstrated in an evaluation of therapeutic couple intervention by Niemeier et al. [29] designed to improve relationship quality. The five 2-hr session therapy focuses on the impact of TBI on the patient, survivor, and couple. The therapy emphasized healthy communication, goal setting, problem-solving, and rebuilding intimacy. Patients with TBI and their partners reported improvement in relationship quality compared to a control group as well as their own baseline. This investigation was followed by another evaluation of the Therapeutic Couples Intervention (TCI) with 75 patients and their partners [36]. They evaluated the unmet needs of the caretaker in a two-arm parallel randomized control trial with a waitlist control. Caregivers in the TCI group showed reductions on 5 of 6 needs scales while the control group did not. In addition, burden was reduced for the TCI group but not the controls. In sum, the former evaluation of the TCI documented how relationship quality can be changed while this evaluation documented how the burden of the caregiver can be reduced.

Given the empirical support for problem solving approaches with family problems and depression [35,37], it seems worthwhile to evaluate problem solving approaches for TBI patients and their family members. As reviewed by Nezu & Nezu [38], problem solving is now seen as a transdiagnostic intervention that has successfully been used in the treatment of a broad range of mental health problems for patients as well as for caregivers of patients with dementia, stroke, and traumatic brain injury [39]. Utilizing the social problem-solving model of D'Zurilla & Nezu [40], Rivera et al. [39] evaluated a 12-session intervention for caregivers who were largely mothers of sons with TBI who had cared for their sons an average of five years. In the problem-solving therapy group, contact between the caregiver and an interventionist was made monthly, with in-home problem-solving training sessions occurring at months 1, 4, 8, and 12. Telephone sessions were conducted once a month for the remaining 8 months. The problem-solving treatment led to greater decreases in depression, health complaints, and dysfunctional problem solving than did an educational control group. On the other hand, there were no changes in caregiver well-being. Baker et al. [28] and Niemeier et al. [29] analyses of treatment outcome literature with TBI patients and their caregivers along with the evaluations of the therapeutic couple intervention

[36] leads us to the conclusion that there is a crucial need for treatment outcome trials, and emerging evidence that problem solving therapy with patients with TBI and their caregivers should be a treatment priority.

Discussion

The highly differential divorce rates of men and women in two national studies with 977 and 1400 patients, respectively, as well as the sexual dissatisfaction results of individuals post TBI, suggest the need for empirical treatment trials of relationship/marital therapies with TBI patients. The efficacy trials of the therapeutic couple intervention with an initial focus on relationship quality and a later focus on reducing caregiver burden allow us to call for more trials of couple treatments for TBI patients and their caregivers. Since it appears useful to encourage individuals with TBI to seek treatment for their problems, it seems important to briefly note that a variety of treatments are seen as useful for this problem. Using National Institutes of Health [41] guidelines regarding treatment, it is apparent that the type and length of treatment will depend on the severity of the injury. Among the varied types of treatment recommended by NIH are the following: physical therapy, occupational therapy, speech therapy, psychological counseling, vocational counseling, and cognitive therapy. The utility of the above treatments will depend on the specifics of any individual case, and skilled diagnosticians are needed to guide the patient and his or her family to the best treatment choices. Given the highly disproportionate divorce rate of men with TBI documented herein [20] as well as the heartening results of the couple interventions on relationship quality and caregiver burden, it is also advised that men and women with TBI seek problem solving and/or marital/relationship therapy.

As noted in the introduction of this manuscript, reviews of the differential impact of TBI on men and woman have used binary classification, and the literature needs to move beyond such classifications. Having broader non-binary classifications of individuals with TBI would help address the documented role of progesterone both in the recovery from and treatment of TBI. In addition, the need for going beyond the binary is important because of the increased likelihood of violence and severe physical victimization in both gay men and lesbian women when compared to their heterosexual counterparts.

Conclusion

The higher hospitalizations, death rates, and divorce rates of men with TBI as well as lower rates of help seeking of men with TBI indicate the need for special attention to ways to foster help seeking and the need for novel treatments. Despite the sobering outcome data for treatment programs for TBI patients and their caregivers, the use of problem-solving therapies and marital/relationship therapies seems especially useful to evaluate in clinical trials with TBI patients and their family members. Marital/relationship therapies have been successful with a broad range of clinical problems and very notably with depression which is elevated in TBI patients. Finally, as documented herein, using a transdiagnostic approach, problem-solving therapies have also been quite successful in treating patients and caregivers with dementia, stroke, and TBI [42].

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