

A Mindfulness-Based Intervention to Improve Quality of Life Among Individuals Who Sustained Traumatic Brain Injuries: One-Year Follow-Up

Michel Bedard
Melissa Felteau
Carrie Gibbons
Rupert Klein

Dwight Mazmanian
Karilyn Fedyk
Gary Mack

Individuals with traumatic brain injuries (TBI) have considerable physical and psychological issues to contend with, many of which are permanent (van Balen HG, Mulder, & Keyser, 1996). Data point to the presence of some form of residual impairment is at least one in four individuals with TBI (Thurman et al., 1996), even in cases where good recovery was believed to have taken place (Conzen et al., 1992; Stuss et al., 1985). The proportion of individuals with an impairment rises to two thirds in the case of major TBI (van Balen HG et al., 1996); recovery is directly related to the injury severity (Asikainen, Kaste, & Sarna, 1998). Not surprisingly, at least 20% of individuals with TBI will be re-hospitalized in the three years following the accident (Cifu et al., 1999). Participants at a consensus conference identified mild TBI is a seriously under-diagnosed problem with potentially considerable societal implications (National Institutes of Health Consensus Development Conference Statement, 1999).

Deficits in executive functions, memory and learning are often documented after TBI (Leon-Carrion et al., 1998; Ponsford, Olver, & Curran, 1995; Woischneck et al., 1997). In addition, at least half of all individuals with TBI experience chronic pain (Lahz & Bryant, 1996), and many also experience sleep problems (Beetar, Guilmette, & Sparadeo, 1996). Many individuals will not return to their previous occupation (employment or school; Dombovy & Olek, 1997; Godfrey, Bishara, Partridge, & Knight, 1993; Ponsford et al., 1995; Ruff et al., 1993; Vogenthaler, Smith, & Goldfader, 1989) and will report a reduction in their ability to perform activities of daily living independently (Greenspan, Wrigley, Kresnow, Branche-Dorsey, & Fine, 1996; Mazaux et al., 1997).

The presence of TBI is associated with depression symptoms (McCleary et al., 1998; Satz et al., 1998), behavior problems, and substance abuse (Ommaya, Salazar, Dannenberg, Chervinsky, & Schwab, 1996). Others may have a form of post-traumatic stress syndrome or feel lonely (Ponsford, 1995). Unfortunately, these emotional consequences, and what some individuals report as a loss of 'self' (Nochi, 1998), are often not addressed by conventional rehabilitation approaches which focus on physical and cognitive impairments (Bontke & Boake, 1991).

The goal of our previous study was to address this void. We used an intervention based on a mindfulness-based stress

reduction (MBSR) approach to improve the quality of life of individuals with TBI (Bédard et al., 2003). The approach, based primarily on the work of Kabat-Zinn (e.g., Kabat-Zinn, 1982; Kabat-Zinn et al., 1992; Kabat-Zinn, Lipworth, & Burney, 1985), has been successful with a number of conditions, including, but not limited to: chronic pain, anxiety, dermatological conditions, and cancer (Astin, 1997; Kabat-Zinn, 1982; Kabat-Zinn et al., 1992; Kabat-Zinn et al., 1998; Kabat-Zinn et al., 1985; Massion, Teas, Hebert, Wertheimer, & Kabat-Zinn, 1995; Miller, Fletcher, & Kabat-Zinn, 1995; Shapiro, Bootzin, Figueredo, Lopez, & Schwartz, 2003; Specia, Carlson, Goodey, & Angen, 2000). The authors of a recent meta-analysis of 20 studies relying on MBSR reported a consistent effect size of 0.5 (considered strong) across various conditions, thus confirming the overall effectiveness of MBSR (Grossman, Niemann, Schmidt, & Walach, 2003).

In our previous study we found that individuals who completed the intervention reported greater improvements in quality of life and greater reductions in depression symptoms than a control group. The findings were both statistically significant and clinically significant. For example, the mean score on the "mental health" domain of the SF-36 improved from 36.7 at baseline to 52.1 at follow-up for the intervention group; the follow up mean was comparable to age- and gender-based normative data (Bédard et al., 2003).

Although these findings were very encouraging, the maintenance of these improvements was not guaranteed. While no follow-up studies have been conducted with individuals who have a TBI (our study was the first published report to our knowledge), maintenance of the positive effects of mindfulness on quality of life and depression symptoms has been reported for up to three months in heterogeneous samples (Majumdar, Grossman, Dietz-Waschkowski, Kersig, & Walach, 2002; Williams, Kolar, Reger, & Pearson, 2001), up to six months for people with cancer (Carlson, Ursuliak, Goodey, Angen, & Specia, 2001), up to 12 months with a heterogeneous group of patients (Reibel, Greeson, Brainard, & Rosenzweig, 2001), and even up to three years for people with anxiety disorders (Miller et al., 1995). The current study was set up to determine if the gains experienced by participants of our previous study were maintained at one year post-intervention.

Methods

The methodology employed has been described in more details in our previous work (Bédard et al., 2003). Briefly, the participants were originally recruited from an out-patient

Michel Bedard, PhD. & Dwight Mazmanian, PhD., Department of Psychology, Lakehead University, 955 Oliver Road, Thunder Bay, Ontario, P7B 5E1, Canada. Carrie Gibbons, MA., and Gary Mack, HBA, Lakehead Psychiatric Hospital. Rupert Klein, HBA, McGill University. Karilyn Fedyk, HSW, Canadian Paraplegic Association.

rehabilitation program, referrals from a local neuropsychologist, and from the local association for brain-injured individuals. Inclusion criteria included brain injury suffered more than one year prior to the study initiation, ability to speak and read English, and aged 18 or more but less than 65. We were able to contact 7 participants from the 10 who completed the original study and they all agreed to participate in this follow-up study.

The intervention was based on Kabat-Zinn's mindfulness-based stress reduction program (Kabat-Zinn, 1982) and Kolb's experiential learning cycle (Kolb, 1984). It consisted of 12 weekly group meetings where we emphasized the importance of psychological well-being as an essential component of health and quality of life, focusing on present moment awareness and acceptance. The primary techniques included: meditation, breathing exercises, guided visualization, and group discussions. To empower the participants to take control of their situations the facilitators encouraged them to use self-exploration as a means to exploit the transformative power present in oneself. Ultimately, the goal was to allow the participants to develop a sense of acceptance, develop new ways to think about the disabilities they faced, and finally, to move beyond the limiting beliefs created by these disabilities.

Each interview took place at the participant's home, approximately 12 months after the completion of the original study. The tools utilized in the follow-up interviews were: 1) 36 item Short Form Health Survey (SF-36; Ware & Kosinski, 2001), 2) Beck Depression Index (BDI-II; Beck, Steer, & Brown, 1996), 3) Symptom Checklist-90-R (SCL-90-R; Derogatis, 1994), 4) Community Integration Questionnaire (CIQ; Sander, Fuchs, High, Kreutzer, & Rosenthal, 1999), and 5) Health Locus of Control (HLC; Wallston, Wallston, & DeVellis, 1978). These scales have well-documented validity and reliability. In addition, we used visual analog scales (VAS) to assess physical pain frequency and intensity, and energy level (Huskisson, 1974). Ethics approval was obtained before contacting the participants for the follow-up study.

To analyze the data we used repeated-measures one-way analysis of variance (ANOVA) with time as the independent variable (baseline, post-intervention, follow-up). We followed statistically significant ANOVAs ($p < .05$) with multiple comparisons to evaluate pair-wise comparisons. For these multiple comparisons we relied on Fisher's Least Significant Difference (LSD) protected t-test with a Bonferroni correction (Howell, 1987).

Results

Five women and two men completed the follow-up interview, 12 months after completion of the program. The average age of the participants at follow-up was 45.6 (SD = 11.2). Only one participant (14.3%) was employed full-time at the time of the follow-up. The other participants derived the majority of their income from non-employment related sources. The total number of prescription medications taken by the participants at follow-up was 2.71 (SD = 2.06), compared to 3.43 (SD = 3.21) at baseline and 3.14 (SD = 3.44) immediately after the intervention. The difference across means did not achieve statistical significance ($F[2,12] = 0.15, p = .861$).

Data on the outcome measures are presented in Table 1. In general the improvements observed after the intervention were maintained at follow-up. The "mental health" component of the SF-36 remained higher than the baseline level, and remained comparable to normative data. Similarly, the "cognitive-affective" scale of the BDI-II indicated a continued reduction in depression symptoms. Interestingly, and contrary to our findings immediately after the intervention, we noted the continued improvement of the participants' reported energy level.

Discussion

The data we presented indicate that gains achieved after the intervention were maintained one year later among participants we were able to contact. These results add to an increasing body of evidence indicating that improvements achieved after MBSR in various clinical populations can be maintained over time. These results are encouraging given how difficult it often is to maintain gains obtained after non-pharmacological interventions and also because few interventions have successfully tackled quality of life and emotional issues among individuals with TBI.

Our findings along with numerous other studies clearly indicate that the magnitude of the impact MBSR can have on some individuals is substantial. We continued to achieve statistical significance on key outcome measures despite a sample size of seven. This is also consistent with Grossman and colleagues' (Grossman et al., 2003) report that the typical effect size of MBSR is approximately 0.5, which represents a strong effect size (Cohen, 1988).

Despite this consistency, our findings need to be interpreted with caution because of the absence of a control group and our inability to contact three of the previous participants. The passage of time alone (i.e., maturation) may have explained the findings

Table 1.

Outcome data from baseline to 1-year follow-up.

	Baseline Mean (SD)	Post-intervention Mean (SD)	Follow-up Mean (SD)	F	p
SF-36					
Physical Functioning	34.07 (9.46)	39.47 (21.62)	39.77 (12.57)	0.532	.601
Role – Physical	29.97 (5.35)	36.04 (9.51)	34.02 (4.88)	1.043	.382
Bodily Pain	30.76 (7.07) ^a	43.05 (10.01) ^b	37.18 (10.49) ^{a,b}	4.566	.034
General Health	38.14 (13.47)	34.84 (7.81)	45.94 (8.98)	3.080	.083
Vitality	36.21 (10.21) ^a	49.05 (6.11) ^b	48.38 (10.01) ^b	8.282	.005
Role – Emotional	34.27 (12.16) ^a	50.83 (5.63) ^b	43.30 (14.17) ^{a,b}	4.875	.028
Mental Health	31.62 (13.61) ^a	50.77 (5.48) ^b	47.85 (9.41) ^b	14.197	.001
Physical Component Score	34.00 (7.03)	34.36 (12.36)	36.77 (7.73)	0.228	.799
Mental Component Score	32.56 (13.09) ^a	52.90 (4.21) ^b	48.01 (12.02) ^b	7.297	.008
BDI					
Total Score	18.57 (14.12)	11.00 (12.34)	8.29 (6.37)	3.698	.056
Cognitive-Affective Scale	11.14 (9.03) ^a	6.29 (7.16) ^{a,b}	4.86 (4.06) ^b	4.606	.033
Somatic-Performance Scale	7.43 (5.77)	4.71 (5.31)	3.43 (2.94)	2.232	.150
SCL-90					
Somatization	57.43 (11.04)	52.43 (9.32)	50.29 (10.98)	1.848	.200
Obsessive-Compulsive	57.29 (9.73) ^a	52.00 (10.49) ^{a,b}	47.14 (10.90) ^b	4.355	.038
Interpersonal Sensitivity	49.14 (13.87)	44.71 (10.83)	44.71 (8.67)	0.977	.404
Depression	51.00 (13.72)	41.86 (8.17)	40.43 (9.48)	3.010	.087
Anxiety	48.14 (18.05)	42.14 (9.55)	37.43 (8.32)	2.158	.158
Hostility	47.14 (10.88)	43.29 (7.23)	44.00 (7.14)	1.118	.359
Phobic Anxiety	52.86 (14.22)	50.14 (14.88)	45.86 (5.58)	1.407	.283
Paranoid Ideation	49.86 (11.57)	44.57 (8.24)	43.71 (11.04)	1.142	.352
Psychoticism	47.43 (11.90)	44.86 (9.51)	43.00 (12.60)	0.874	.442
Global Severity Index	51.71 (14.31)	44.71 (11.57)	41.86 (10.82)	2.570	.118
Positive Symptom Distress Index	51.57 (14.86)	42.43 (10.28)	43.29 (12.33)	1.649	.233
Positive Symptom Total	50.43 (11.67)	46.29 (10.77)	41.86 (9.79)	2.692	.108
CIQ					
Home Competency Scale	6.57 (3.21)	7.00 (2.31)	6.86 (3.39)	0.182	.836
Social Integration Scale	5.57 (2.37)	6.29 (2.29)	6.57 (2.94)	0.770	.485
Productive Activity Scale	2.00 (1.67)	2.17 (1.47)	2.50 (1.76)	0.202	.820
HLC					
Internal	29.85 (9.84)	31.71 (7.57)	34.57 (7.66)	1.631	.236
Powerful Others	25.00 (5.97)	23.43 (6.80)	22.57 (4.54)	0.549	.591
Chance	24.00 (4.58)	26.43 (6.29)	22.29 (6.55)	2.663	.110
VAS					
Pain Frequency	77.71 (28.25)	46.29 (33.86)	58.57 (41.14)	2.086	.167
Pain Intensity	66.29 (27.40)	42.00 (25.52)	49.43 (30.90)	2.715	.106
Energy Level	24.14 (17.22) ^a	46.57 (18.50) ^{a,b}	65.57 (19.64) ^b	9.590	.003

Different superscripts denote statistically significant differences between means.

we reported. Other changes in the situation of the participants may also have contributed to the maintenance of the improvement noted post-intervention. However, we noted that only one participant was working full-time, and that no change was observed on the CIQ. In addition, because the findings are consistent with follow-up data obtained by many investigators, and because of the theoretical links between the approach and the outcome measures that showed improvement, we remain optimistic about the value of MBSR in this population.

Some important issues remain to be examined. First, we

need to determine if the intervention could be applied to a larger segment of individuals with TBI. Second, we need to determine the ultimate timing of the intervention. While the participants of our study had completed traditional rehabilitation programs we may be able to achieve better outcomes, both physical and psychological, by introducing MBSR earlier in the rehabilitation process. Third, we also need to determine the extent to which participants continue to use the skills they acquired and whether periodical booster sessions would enhance the long-term effects of the intervention. Because we did not use a true prospective

design for this study we could not verify that participants continued to use the training provided during the intervention on a regular basis; this aspect remains to be investigated thoroughly.

The intervention holds considerable promise in our view because it has, so far, proved effective and it was provided at a reasonable cost. Given that recent data suggest that interventions such as MBSR may lead to reduced health care utilization (Roth & Crane-Ross, 2002) one important next step will be to demonstrate the cost-effectiveness of the intervention.

Acknowledgements

This study was supported by a research grant from the Ontario Neurotrauma Foundation and a SSHRC Research Development grant awarded to the first author. Michel Bedard is a Canada Research Chair in Aging and Health (www.chairs.gc.ca); he acknowledges the support of the Program.

References

- Asikainen, I., Kaste, M., & Sarna, S. (1998). Predicting late outcome for patients with traumatic brain injury referred to a rehabilitation programme: A study of 508 Finnish patients 5 years or more after injury. *Brain Injury*, 12, 95-107.
- Astin, J. A. (1997). Stress reduction through mindfulness meditation. *Psychotherapy and Psychosomatics*, 66, 97-106.
- Beck, A. T., Steer, R. A., & Brown, G. K. (1996). *Beck Depression Inventory-II (BDI-II)*. Toronto: The Psychological Corporation, Harcourt Brace.
- Bédard, M., Felteau, M., Mazmanian, D., Fedyk, K., Klein, R., Richardson, J. et al. (2003). Pilot evaluation of a mindfulness-based intervention to improve quality of life among individuals who sustained traumatic brain injuries. *Disability and Rehabilitation*, 25, 722-731.
- Beetar, J. T., Guilmette, T. J., & Sparadeo, F. R. (1996). Sleep and pain complaints in symptomatic traumatic brain injury and neurologic populations. *Archives of Physical Medicine and Rehabilitation*, 77, 1298-1302.
- Bontke, C. F. & Boake, C. (1991). Traumatic brain injury rehabilitation. *Neurosurgery Clinics of North America*, 2, 473-482.
- Carlson, L. E., Ursuliak, Z., Goodey, E., Angen, M., & Specia, M. (2001). The effects of a mindfulness meditation-based stress reduction program on mood and symptoms of stress in cancer outpatients: 6-month follow-up. *Supportive Care in Cancer*, 9, 112-123.
- Cifu, D. X., Kreutzer, J. S., Marwitz, J. H., Miller, M., Hsu, G. M., Seel, R. T. et al. (1999). Etiology and incidence of rehospitalization after traumatic brain injury: A multicenter analysis. *Archives of Physical Medicine and Rehabilitation*, 80, 85-90.
- Cohen, J. (1988). *Statistical power analysis for the behavioral sciences*. (2nd Edition ed.) Hillsdale, NJ: Erlbaum.
- Conzen, M., Ebel, H., Swart, E., Skreczek, W., Dette, M., & Oppel, F. (1992). Long-term neuropsychological outcome after severe head injury with good recovery. *Brain Injury*, 6, 45-52.
- Derogatis, L. R. (1994). *SCL-90-R administration, scoring, and procedures manual*. (Third Edition ed.) Minneapolis: National Computer Systems.
- Dombovy, M. L. & Olek, A. C. (1997). Recovery and rehabilitation following traumatic brain injury. *Brain Injury*, 11, 305-318.
- Godfrey, H. P., Bishara, S. N., Partridge, F. M., & Knight, R. G. (1993). Neuropsychological impairment and return to work following severe closed head injury: Implications for clinical management. *New Zealand Medical Journal*, 106, 301-303.
- Greenspan, A. I., Wrigley, J. M., Kresnow, M., Branche-Dorsey, C. M., & Fine, P. R. (1996). Factors influencing failure to return to work due to traumatic brain injury. *Brain Injury*, 10, 207-218.
- Grossman, P., Niemann, L., Schmidt, S., & Walach, H. (2003). Mindfulness-based stress reduction and health benefits. A meta-analysis. *Journal of Psychosomatic Research*, 55, 1-9.
- Howell, D. C. (1987). *Statistical methods for psychology*. (2nd ed.) Boston: Duxbury Press.
- Huskisson, E. C. (1974). Measurement of pain. *The Lancet*, 2, 1127-1131.
- Kabat-Zinn, J. (1982). An outpatient program in behavioral medicine for chronic pain patients based on the practice of mindfulness meditation: theoretical considerations and preliminary results. *General Hospital Psychiatry*, 4, 33-47.
- Kabat-Zinn, J., Lipworth, L., & Burney, R. (1985). The clinical use of mindfulness meditation for the self-regulation of chronic pain. *Journal of Behavioral Medicine*, 8, 163-190.
- Kabat-Zinn, J., Massion, A. O., Kristeller, J., Peterson, L. G., Fletcher, K. E., Pbert, L. et al. (1992). Effectiveness of a meditation-based stress reduction program in the treatment of anxiety disorders. *The American Journal of Psychiatry*, 149, 936-943.
- Kabat-Zinn, J., Wheeler, E., Light, T., Skillings, A., Scharf, M. J., Cropley, T. G. et al. (1998). Influence of a mindfulness meditation-based stress reduction intervention on rates of skin clearing in patients with moderate to severe psoriasis undergoing phototherapy (UVB) and photochemotherapy (PUVA). *Psychosomatic Medicine*, 60, 625-632.

- Kolb, D. A. (1984). *Experiential learning: Experience as the source of learning and development*. Englewood Cliffs, NJ: Prentice-Hall.
- Lahz, S. & Bryant, R. A. (1996). Incidence of chronic pain following traumatic brain injury. *Archives of Physical Medicine and Rehabilitation*, 77, 889-891.
- Leon-Carrion, J., Alarcon, J. C., Revuelta, M., Murillo-Cabezas, F., Dominguez-Roldan, J. M., Dominguez-Morales, M. R. et al. (1998). Executive functioning as outcome in patients after traumatic brain injury. *International Journal of Neuroscience*, 94, 75-83.
- Majumdar, M., Grossman, P., Dietz-Waschkowski, B., Kersig, S., & Walach, H. (2002). Does mindfulness meditation contribute to health? Outcome evaluation of a German sample. *Journal of Alternative and Complementary Medicine*, 8, 719-730.
- Massion, A. O., Teas, J., Hebert, J. R., Wertheimer, M. D., & Kabat-Zinn, J. (1995). Meditation, melatonin and breast/prostate cancer: hypothesis and preliminary data. *Medical Hypotheses*, 44, 39-46.
- Mazaux, J. M., Masson, F., Levin, H. S., Alaoui, P., Maurette, P., & Barat, M. (1997). Long-term neuropsychological outcome and loss of social autonomy after traumatic brain injury. *Archives of Physical Medicine and Rehabilitation*, 78, 1316-1320.
- McCleary, C., Satz, P., Forney, D., Light, R., Zaucha, K., Asarnow, R. et al. (1998). Depression after traumatic brain injury as a function of Glasgow Outcome Score. *Journal of Clinical and Experimental Neuropsychology*, 20, 270-279.
- Miller, J. J., Fletcher, K., & Kabat-Zinn, J. (1995). Three-year follow-up and clinical implications of a mindfulness meditation-based stress reduction intervention in the treatment of anxiety disorders. *General Hospital Psychiatry*, 17, 192-200.
- National Institutes of Health Consensus Development Conference Statement (1999). Consensus conference. Rehabilitation of persons with traumatic brain injury. NIH Consensus Development Panel on Rehabilitation of Persons With Traumatic Brain Injury. *Journal of the American Medical Association*, 282, 974-983.
- Nochi, M. (1998). "Loss of self" in the narratives of people with traumatic brain injury: A qualitative analysis. *Social Science and Medicine*, 46, 869-878.
- Ommaya, A. K., Salazar, A. M., Dannenberg, A. L., Chervinsky, A. B., & Schwab, K. (1996). Outcome after traumatic brain injury in the U.S. military medical system. *The Journal of Trauma*, 41, 972-975.
- Ponsford, J. (1995). *Traumatic brain injury: Rehabilitation for everyday adaptive living*. Hove, U.K.: Lawrence Erlbaum Assoc.
- Ponsford, J. L., Olver, J. H., & Curran, C. (1995). A profile of outcome: 2 years after traumatic brain injury. *Brain Injury*, 9, 1-10.
- Reibel, D. K., Greeson, J. M., Brainard, G. C., & Rosenzweig, S. (2001). Mindfulness-based stress reduction and health-related quality of life in a heterogeneous patient population. *General Hospital Psychiatry*, 23, 183-192.
- Roth, D. & Crane-Ross, D. (2002). Impact of services, met needs, and service empowerment on consumer outcomes. *Mental Health Services Research*, 4, 43-56.
- Ruff, R. M., Marshall, L. F., Crouch, J., Klauber, M. R., Levin, H. S., Barth, J. et al. (1993). Predictors of outcome following severe head trauma: follow-up data from the Traumatic Coma Data Bank. *Brain Injury*, 7, 101-111.
- Sander, A. M., Fuchs, K. L., High, W. M. J., Kreutzer, J. S., & Rosenthal, M. (1999). The community integration questionnaire revisited: An assessment of factor structure and validity. *Archives of Physical Medicine and Rehabilitation*, 80, 1303-1308.
- Satz, P., Forney, D. L., Zaucha, K., Asarnow, R. R., Light, R., McCleary, C. et al. (1998). Depression, cognition, and functional correlates of recovery outcome after traumatic brain injury. *Brain Injury*, 12, 537-553.
- Shapiro, S. L., Bootzin, R. R., Figueredo, A. J., Lopez, A. M., & Schwartz, G. E. (2003). The efficacy of mindfulness-based stress reduction in the treatment of sleep disturbance in women with breast cancer. *Journal of Psychosomatic Research*, 54, 85-91.
- Specia, M., Carlson, L. E., Goodey, E., & Angen, M. (2000). A randomized, wait-list controlled clinical trial: The effect of a mindfulness-based stress reduction program on mood and symptoms of stress in cancer outpatients. *Psychosomatic Medicine*, 62, 613-622.
- Stuss, D. T., Ely, P., Hugenholtz, H., Richard, M. T., LaRochelle, S., Poirier, C. A. et al. (1985). Subtle neuropsychological deficits in patients with good recovery after closed head injury. *Neurosurgery*, 17, 41-47.
- Thurman, D. J., Jeppson, L., Burnett, C. L., Beaudoin, D. E., Rheinberger, M. M., & Sniezek, J. E. (1996). Surveillance of traumatic brain injuries in Utah. *Western Journal of Medicine*, 165, 192-196.
- van Balen HG, Mulder, T., & Keyser, A. (1996). Towards a disability-oriented epidemiology of traumatic brain injury. *Disability and Rehabilitation*, 18, 181-190.

- Vogenthaler, D. R., Smith, K. R. J., & Goldfader, P. (1989). Head injury, an empirical study: Describing long-term productivity and independent living outcome. *Brain Injury, 3*, 355-368.
- Wallston, K. A., Wallston, B. S., & DeVellis, R. (1978). Development of the multidimensional health locus of control (MHLC) scales. *Health Education Monographs, 6*, 160-171.
- Ware, J. E. & Kosinski, M. (2001). *SF-36 physical and mental health summary: A manual for users of version 1*. (Second Edition ed.) Lincoln, RI: QualityMetric.
- Williams, K. A., Kolar, M. M., Reger, B. E., & Pearson, J. C. (2001). Evaluation of a wellness-based mindfulness stress reduction intervention: A controlled trial. *American Journal of Health Promotion, 15*, 422-432.
- Woischneck, D., Firsching, R., Ruckert, N., Hussein, S., Heissler, H., Aumuller, E. et al. (1997). Clinical predictors of the psychosocial long-term outcome after brain injury. *Neurological Research, 19*, 305-310.