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Review Article

Return to Driving in Mild Traumatic Brain Injury: Evaluation of Coping Strategies, Resilience, and Psychological Distress

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Abstract

Background: This study explored whether emotional distress, coping, and/or resilience contributed to return to driving (RTD) following experienced mild traumatic brain injury, and whether these variables of interest differed among those who had and had not RTD.

Methods: The present study evaluated de-identified archival data of 65 patients with mTBI following an MVA. Patients were either the driver, passenger, /or pedestrian struck by a motor vehicle, and aged 22 to 69 years. The sample consisted of 36 men and 29 women with an average education. The mean months elapsed between the accident and the assessment was 16.82 months. Pearson correlations were used to test for associations between all explanatory and outcome variables. Separate linear and hierarchical regressions were carried out to evaluate whether variables of interest were significant predictors of RTD.

Results: Findings revealed that the presence of depressive symptoms was associated with coping, irrespective of style, resilience, driving-related anxiety, and RTD. Moreover, RTD was related to driving-related anxiety, too, and in fact, anxiety (considering the presence of depressive symptoms) appeared to be an even greater limiting factor when considering RTD in this population. Age, gender, and education did not influence RTD.

Conclusion: The present study revealed that depressive symptoms and driving-related anxiety in particular contribute to whether patients with mTBI RTD, irrespective of time since injury, age, and gender. Coping styles and resilience did not predict RTD. Further work is warranted to address the paucity of research investigating RTD parameters that contribute to and/or hinder RTD among mTBI sufferers.

More Information

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Keywords: Return to driving; Mild traumatic brain injury; Coping styles; Resilience; Emotional distress

Introduction

One-half of the world's population has experienced a Traumatic Brain Injury [1]. TBI is a leading cause of death and disability globally, with the proportion resulting from motor vehicle incidents (MVAs) [2]. The overall incidence of TBI per 100,000 people appears greatest in North America (and Europe), and as such, these countries experience the greatest overall burden of disease [2]. Consequently, those having suffered TBI subsequently experience significant barriers concerning autonomous functioning, including the ability to re-engage in driving [3], which may be affected by injury severity [4]. Mild injuries comprise the majority of cases [5,6], representing the largest group of TBI sufferers seen in hospitals [7].

Mild TBI (mTBI) can lead to a preponderance of endorsed symptoms, including issues with emotional distress [8-12]. Not only do some patients continue to report having one or more such complaints post-TBI, emotional sequelae [13,14], and quality of life issues like problems with return to driving (RTD), can persist following injury [15,16]. It has been estimated that up to 70% of TBI sufferers RTD within 5-10 years of injury [17]. The published literature has most predominately focused on cognitive status and driving behaviours and in more severe injury specifically [18], as RTD factors, and/or as related to certain life roles, such as education and vocation [19]. Even though evaluation of the correlates of RTD following a MVA is an important avenue of research for patient autonomy and relatedly recovery to premorbid life, there is a paucity of published research focused on psychosocial correlates of RTD in mTBI.

The development of emotional difficulties, and in particular, the emergence of depressive symptoms and/ or heightened anxiety, is a common occurrence following a TBI due to an MVA [20,21]. Point of fact, the impact of depression on post-MVA functioning has been emphasized [13] and found to occur in up to 77% of TBI sufferers, with a frequency rate of 50% in the first year [22], and a lifetime prevalence of 26.7% [23]. Although the research is more limited, there have been recent efforts to evaluate the relationship between anxiety and functional outcome, even though the prevalence of anxiety following a TBI-related MVA is high post-injury (i.e., upwards of 70%) [20]. Anxiety appears to be a stronger predictor of long-term functional impairment and poor psychosocial outcome than depression in those with brain injury [24]. The development of driver-related anxiety has been found to occur in around 38% of TBI patients post-MVA [25,26]. This research highlights that the presence of driving anxiety hinders return to daily activities that provide, importantly, autonomous function. Circularly, anxiety can lead to heightened emotional distress, and as such, a diminished quality of life [27-29], which together impedes recovery post-injury.

Research has also demonstrated that coping and the ability to "bounce back" (i.e., resilience) affect recovery as well [30-35] and play an important role in adapting to the consequences of TBI. Coping style appears to influence the ability to manage and hence adapt to stressful situations that may be beyond a person's resources [36]. Avoidance-Oriented Coping refers to those thoughts and behaviours directed toward avoiding the problem [36], and Emotion-Oriented Coping is the emotional response to adverse situations. The latter entails changing one's perception of the stressful situation to no longer provoke negative emotions [37]. This involves the refusal to believe the problem exists, feelings of hopelessness, or the engagement in irrelevant pursuits to reduce stress [36,38]. In contrast, Task-Oriented Coping is the attempt to solve. It entails directly acting to change the circumstances to decrease situationally induced stress [39]. Task-Oriented Coping is considered adaptive while Avoidance- and Emotion-Oriented Coping are considered maladaptive and linked to experienced anxiety and depression [40].

There is evidence to suggest that the usage of ineffective coping styles amongst those with TBI [41,42] contributes to heightened emotional distress (like experienced anxiety and depression) [30,43]. Resilience following exposure to trauma may also influence recovery post-TBI [44,45]. Several studies have suggested that psychological health is comparable to resilience following trauma exposure [46-49], and that TBI sufferers tend to exhibit lower resilience. Additionally, high resilience has been related to decreased depressive symptom complaints [50]. Hence, it appears from the extant literature that the use of maladaptive coping styles and low resilience amongst TBI sufferers plays a key role in emotional adaptability following an experienced MVA. Moreover, this relationship impacts return to premorbid life activities post-TBI, including RTD [51,52].

RTD is an important indicator of injury recovery [4]. Existing literature has reported that 40-78% of patients RTD post-TBI [53-56]. As such, the inability to RTD following a TBI can significantly affect quality of life [4,54,57]; failure to drive can decrease community participation, increase emotional distress, and decrease overall life satisfaction [54]. The purpose of the present study was to explore whether (1) reported emotional distress predicted RTD; (2) whether the effect of coping styles and/ or perceived resilience were significant contributors to RTD, and (3) if emotional distress and/ or coping and resilience differed among those that have and have not RTD. By these goals, we expected that those TBI sufferers who had returned to driving would also present themselves with better coping and/or resilience, and, as well, reduced expression of emotional distress (i.e., psychological health). Further, we also explored whether the extent of symptom reporting influenced RTD. We felt that it was important to provide the most accurate picture of the relationships among measures of interest, given the vast literature that has evaluated exaggerated symptom self-report in mTBI [58]; this investigation was novel and exploratory.

Materials and methods

Participants

Recruitment: The present study evaluated de-identified archival data of 65 patients with mTBI following an MVA. Patients were either the driver, passenger, /or pedestrian struck by a motor vehicle, and aged 22 to 69 years (M_{age} = 40.32, SD_{age} = 12.86). The sample consisted of 36 men (55.39%) and 29 women (44.62%). Participants' average years of education were 13.63 (*SD* = 2.83). The mean months elapsed between the accident and the assessment was 16.82 (*SD* = 13.31). Please refer to Table 1 for demographic information.

Table 1: Demographic Characteristics.

Demographic Characteristic	Descriptives
Age (Years)	
Mean (SD)	40.32 (12.86)
Range	22-69 years
Gender, n (%)	
Men	36 (55.39%)
Women	29 (44.62%)
Time Since Injury	
Mean (SD)	16.82 (13.31)
Range	4-82 months
Education (Years)	
Mean (SD)	13.63 (2.83)
Range	8-20
Currently Driving, n (%)	
Yes	43 (66.15%)
No	22 (33.85%)

Abbreviations: Mean (SD: Standard Deviation)

All patients were undergoing assessment for recommendations for remediation and/or receiving therapy for lingering symptoms. Participants were included if they were adults over age 18 years, English speaking, and had sustained a mTBI, defined as a Glasgow Coma Scale (GCS) score of 13 to 15, loss of consciousness (LOC) less than 30 minutes, and PTA less than 24 hours [59].

Exclusion criteria were current and uncontrolled substance use, psychiatric illness (i.e., Schizophrenia or other psychosis), and/or diagnosed, pre-existent psychological conditions commonly observed in this population (i.e., depression, bipolar disorder, anxiety, phobias, generalized anxiety, adjustment disorders), neurological conditions (including headache), developmental disorders, and multiple head traumas (including more than one concussion/mTBI).

Patients also completed the Structured Inventory of Malingered Symptomatology (SIMS). Seventy-four percent of the sample appeared to have over-reported symptomatology as indicated by the Total SIMS score (please refer to the 'Measures' section for further questionnaire details).

The study was approved by the. Toronto Metropolitan University Research Ethics Board.

Questionnaires

Study participants completed the Coping Inventory of Stressful Situations [39] to evaluate coping strategies, the Brief Resilience Scale [49] to examine resilience, the Depression Anxiety Stress Scales [60] to better determine the level of expressed depression symptoms, and the Accident Fear Questionnaire (AFQ) to evaluate driving-related anxiety symptoms [61]. Functional outcome was assessed by driving status.

The Coping Inventory of Stressful Situations (CISS)

The CISS is a 48-item self-report scale that assesses coping strategies in adverse situations.

The coping strategies evaluated include Task-Oriented Coping, Emotion-Oriented Coping, and Avoidance-Oriented Coping. Avoidance-Oriented Coping involves the person trying to escape or get around stressful situations through distraction or social diversion. As such, the Avoidance-Oriented Coping has been divided into two subscales: Distraction and Social Diversion, with 8 items and 5 items, respectively. Each coping strategy is evaluated using 16 items [39] and scored on a 5-point Likert scale ranging from 1 = *not at all* to 5 = *very much*. Scores for items for each scale are summed up, and higher scores reflect greater use of that particular coping strategy. The CISS has excellent internal reliability and construct validity in patients with acquired brain injury [62]. Additionally, Greene, et al. [63] found strong psychometric properties of the CISS when assessing coping styles in a TBI population. Further, reliability was found to be strong when evaluating coping styles in those with psychiatric illness (i.e., Major Depressive Disorder) and healthy populations [64,65].

The Brief Resilience Scale (BRS)

The BRS is a 6-item scale that assesses a person's capacity to pull through or adapt to adverse situations [49]. Participants are asked to specify their level of agreement with each statement as being descriptive of their behaviour. A 5-point Likert scale is employed, ranging from 1 = *strongly disagree* to 5 = *strongly agree*. Statements 1, 3, and 5 are worded affirmatively, while statements 2, 4, and 6 are worded negatively. Statements 2, 4, and 6 are reverse-coded, meaning that 'strongly disagree' is scored as 5 and 'strongly agree' is scored as 1.

The scores are totaled and then translated as either low resilience, ranging from 1.00 to 2.99, normal resilience, ranging from 3.00 to 4.30, to high resilience, ranging from 4.31 to 5.00 [49]. The scale expresses good internal reliability and convergent validity [66]. In addition to having good reliability and validity within the chronic pain and healthy populations [49], the measure has also been found to have good reliability within the aging population [67]. Within the TBI literature, the BRS has been utilized to evaluate whether resilience contributes to TBI recovery [34].

The Depression Anxiety Stress Scales (DASS)

The DASS is a 42-item scale that examines the level of experienced stress, anxiety, and depression [60]. The scale uses a 4-point Likert scale with responses ranging from 0 = *did not apply to me at all* to 3 = *applied to me very much, or most of the time*. The items about depression (DASS-D) include statements 1, 6, 8, 11, 12, 14, and 18. The items about anxiety (DASS-A) are items 2, 4, 7, 9, 15, 19, and 20. The stress (DASS-S) queries are statements 3, 5, 10, 13, 16, 17, and 21. The depression scores are interpreted as normal (0-6), mild (7-9), moderate (10-14), severe (15-19), or extremely severe (20-42). The anxiety scores are interpreted as either normal (0-9), mild (10-12), moderate (13-20), severe (21-27), or extremely severe (28-42). The stress scores are interpreted as either normal (0-10), mild (11-18), moderate (19-26), severe (27-34), or extremely severe (35-42). The DASS has been found to have excellent internal reliability, consistency, and satisfactory discriminant and convergent validity [68]. It has been employed in a variety of populations, from aging to substance abuse [69,70]. Further, it has been utilized to evaluate emotional distress post-TBI [71] and found to be a valid screening measure in the TBI population [72].

The Accident Fear Questionnaire (AFQ)

The AFQ is a 20-item scale that assesses several situations post-MVA, related to driving and/or traveling as a passenger [61]. Respondents rate the items according to how much they would avoid the presented situations, such as *driving as a passenger*. They are asked to rate 10 items using an

8-point Likert scale, ranging from 0 = *would not* to 8 = *always*. Statements measure the patient's fear and avoidance of being in a vehicle after an MVA. There is an indication of its validity in patients with TBI [73].

Structured Inventory of Malingered Symptomatology (SIMS)

The SIMS is a 75-item true/false measure intended for use with individuals at least 18 years of age [74]. The self-report measure is used to assess feigned symptoms across 5 independent subscales: Psychosis, Neurologic Impairment, Amnesic Disorders, Low Intelligence and Affective Disorders. Question responses are limited to either 1 (True) or 2 (False). The total composite score, which is a good validity indicator [75], is calculated by summing the raw subscale scores, with possible scores ranging from 0 to 75. A Total Score greater than 14 is purported to reflect the likelihood of symptom exaggeration. The SIMS has been shown to demonstrate both convergent validity and incremental validity in comparison to clinical judgment based on interviews and/or record data alone [76,77]. The questionnaire has been utilized with many populations, including an MVA population [78].

Please refer to Table 2 for the means and SD of all self-reported measures.

Results

Overview

All analyses were performed using R Statistical Software [79]. Demographic characteristics (mean (SD), ranges) in patients with mTBI were presented in Table 1. Pearson correlations were used to test for associations between all explanatory and outcome variables. The analyses were performed among demographic (i.e., gender, age), clinical characteristics (i.e., months elapsed from injury to assessment [i.e., time since injury], resilience level), and RTD, to assess suitability for inclusion as potential covariates in further analyses.

The rationale for this process was derived from previous analogous research [80]. Preliminary analyses were conducted to check the assumptions of normality, linearity, homoscedasticity, and multicollinearity. Separate linear regressions were carried out to evaluate whether coping style, resilience, driving-related anxiety, and depressive symptoms were significant predictors of RTD. Hierarchical regressions were conducted to evaluate whether participants' SIMS scores accounted for a significant amount of variance in RTD, above and beyond that associated with driving-related anxiety and depressive scores. An additional hierarchical regression was conducted to evaluate the associative value of including both driving-related anxiety and depressive symptoms on RTD. Welch's t-tests were employed to compare primary explanatory and outcome variables in those who RTD as compared to those who did not.

Table 2: Self-Report Questionnaires.

Variable	Mean	SD	Range
CISS-Task	50.25	14.19	16-75
CISS-Emotion	55.77	10.10	29-73
CISS-Avoidance	44.22	12.55	22-74
BRS	14.05	4.20	6-26
DASS-A	20.62	11.24	0-42
DASS-D	25.32	11.91	0-42
DASS-S	27.41	9.72	6-42
AFQ	49.89	17.07	11-80
SIMS-Total	24.51	12.24	3-60
SIMS <14	10.24	3.21	3-14
SIMS >14	29.56	10.03	15-60

Abbreviations: Coping Inventory for Stressful Situations (CISS); Brief Resilience Scale (BRS); Depression, Anxiety and Stress Scale (DASS); Accident Fear Questionnaire (AFQ); Structured Inventory of Malingered Symptomatology (SIMS).

Correlational analyses revealed no significant associations between demographic characteristics (i.e., age, gender), clinical considerations (i.e., time since injury, resilience level), and the primary outcome variable - RTD (data not shown). Similar analyses were also conducted to establish whether there were significant associations among the primary variables of interest (Table 3). The findings revealed that the presence of depressive symptoms was associated with coping, irrespective of style, resilience, driving-related anxiety, and RTD.

Resilience was related to coping ability, particularly Task Oriented and Avoidance Oriented.

Coping. Interestingly, driving-related anxiety was not linked to any particular coping style.

Moreover, RTD was not only associated with depression, but driving-related anxiety too.

We assessed the impact of the months elapsed from injury to assessment on our primary variables of interest. No findings emerged (results not shown). Examination of months since injury was also evaluated as a dichotomous variable, given the noted range of 'time since injury'. Months elapsed between 0 and 12 were coded as 0 (n = 28), and months elapsed above 13 were coded as 1 (n = 27). Please refer to Table 4 for the t-test results. It appears that avoidance-oriented coping and resiliency both approached significance, with the suggestion that TBI sufferers tend to engage in the least sufficient approach to coping and that their resilience is lower than that within the first year post-injury

To further explore the relationship between these variables and RTD, four logistic regressions were conducted examining whether age, gender, time since injury, and high/low resilience predicted RTD, respectively. Although age appeared to be approaching significance (b = 0.43, SE = .024, p = .066, 95% CI [-.00, -.093]), there was no support for gender, time since injury, or resilience level. Based on both the correlational analyses and regression findings, gender, age,

Table 3: Correlational analyses among primary variables of interest.

Variable	1	2	3	4	5	6
1. DASS-D						
2. CISS-Task	-.36**					
	[-.56, -.12]					
3. CISS-Emotion	.37**	-.23				
	[.13, .56]	[-.45, .02]				
4. CISS- Avoidance	-.27*	.52**	-.09			
	[-.48, -.02]	[.32, .68]	[-.32, .16]			
5. BRS	-.50**	.55**	-.20	.40**		
	[-.66, -.29]	[.35, .70]	[-.43, .05]	[.17, .59]		
6. AFQ	.37**	-.15	.21	-.20	-.20	
	[.14, .56]	[-.38, .10]	[-.04, .44]	[-.42, .05]	[-.43, .04]	
7. RTD	-.31*	-.06	-.05	-.08	.14	-.42**
	[-.51, -.07]	[-.30, .19]	[-.29, .20]	[-.32, .17]	[-.11, .38]	[-.60, -.20]

Abbreviations: *M* and *SD* are used to represent mean and standard deviation, respectively. Values in square brackets indicate the 95% confidence interval for each correlation. The confidence interval is a plausible range of population correlations that could have caused the sample correlation (Cumming, 2014). * indicates $p < .05$. ** indicates $p < .01$.

Table 4: T-test Results Comparing Months Elapsed on Primary Variables.

Outcome	Months Elapsed (0 to 12)		Months Elapsed (13+)		*t* - value	df	*p* value	95% CI		Cohen's d
	M	SD	M	SD				Lower	Upper	
Anxiety	48.11	17.94	51.78	16.85	-.782	52.97	.437	-13.08	5.74	.21
Depression	23.36	10.81	26.37	12.68	-.947	51.05	.348	-9.40	3.38	.26
Task-oriented coping	53.63	14.69	49.22	14.34	1.115	51.97	.269	-3.52	12.34	.30
Emotion-oriented coping	57.26	8.7	55.48	10.93	.661	49.51	.512	-3.62	7.18	.18
Avoidance-oriented coping	46.63	13.51	41.00	10.77	1.694	49.54	.097	-1.05	12.31	.46
Resilience	15.22	4.51	13.00	3.94	1.9279	51.08	.059	-.09	4.54	.52

time since injury, and high/low resilience were not included in further analyses as probable confounding variables.

A SIMS composite total score above 14 has been suggested to indicate the possibility of significant symptom over-reporting. However, the most recent review has posited that when using the common cut-off score, the SIMS may not reliably distinguish feigned psychopathology from severe manifestations of genuine psychiatric illness [76]. Based on this work, statistical analyses were conducted to determine whether the SIMS score accounted for significant additional variance in RTD outcomes above that related to psychological distress symptoms. Two hierarchical regressions were carried out to examine the additional variance of SIMS scores' inclusion in models testing the associations among driving-related anxiety (Model 1) and depressive symptoms (Model 2) on RTD. Patients with SIMS total scores of 14 and under were coded as 1 (n = 17), and scores 15 and above were coded as 2 (n = 48).

For the first hierarchical regression, driving-related anxiety was found to be significantly associated with RTD, b = -.01, SE = .003, t(63) = -3.705, p = .000448, 95% CI [-.018, -.005], β = -.30. Further, the inclusion of driving-related anxiety as an explanatory variable contributed significantly to the regression model, F(1,63) = 13.73, p = .0004, and accounted for 16.59% (adjusted R^2 value) of the variance in RTD.

Step 2 included the SIMS variable to evaluate whether this variable accounted for significant additional variance in RTD above that related to driving-related anxiety. Results revealed that SIMS scores were not significantly associated with RTD, b = .11, SE = .13, t(62) = .815, p = .418384. The inclusion of this variable contributed little additional explained variance in functional disability, R^2 = .1614. Importantly, the (lack of) change in R^2 by adding SIMS acceptability to the model was not significant, F(1,62) = .66, p = .4184.

Similar to the first model, our second hierarchical regression model first tested the association between depressive symptoms and RTD, indicating that depressive symptoms were significantly associated with RTD, b = -.01, SE = .005, t(63) = -2.54, p = .0135. Further, depression as an explanatory variable contributed significantly to the regression model, F(1,63) = 6.46, p = .01348, and accounted for 7.9% (adjusted R^2 value) of the variance in RTD. Step 2 included the SIMS variable, evaluating whether the inclusion of the variable accounted for significant additional variance in RTD above depression symptoms alone. Results revealed that SIMS scores were not significantly associated with RTD, b = .20, SE = .16, t(62) = 1.25, p = .215. Importantly, although the regression model including SIMS acceptability was significant, F(2,62) = 4.047, p = .022, the inclusion of this variable contributed little additional explained variance in RTD, R^2 = .08694. Importantly, the (lack of) change in R^2 by adding SIMS acceptability to the model was not significant, F(1,62) = 1.57, p = .2147.

Given that a large proportion of our participants had elevated SIMS scores, we assessed SIMS status according to our primary variables. Please refer to Table 5 for the t-test results. Even though SIMS status did not affect the presence

Table 5: T-test Results Comparing SIMS Status on Primary Variables.

Outcome	SIMS Score 14 d and Under (n = 17)		SIMS Score 15 and Above (n = 48)		t - value	df	p - value	95% CI		Cohen's d
	M	SD	M	SD				LL	UL	
Anxiety	40.24	18.8	53.31	15.2	-2.59	23.85	.0162	-23.52	-2.64	.81
Depression	13.77	10.67	29.42	9.43	-5.35	25.41	.000***	-21.67	-9.63	1.60
Task-oriented coping	57.65	10.24	47.57	14.55	3.08	40.41	.004*	3.47	16.67	.74
Emotion-oriented coping	49.47	10.7	58.04	8.94	-2.95	24.56	.01**	-14.56	-2.58	.91
Avoidance-oriented coping	48.82	12.39	42.55	12.31	1.79	28.21	.084	-.90	13.44	.51
Resilience	16.35	4.23	13.21	3.9	2.68	26.50	.013**	.73	5.55	.79

Abbreviation: Structured Inventory of Malingered Symptomatology (SIMS); ***p < .001, **p < .01, *p < .05.

of driver-related anxiety or driving status [chi-square analysis revealed a non-significant relationship: $X2(1, N = 65) = .202$, $p = .653$], those who did not endorse elevation on the SIMS indicated having fewer depressive symptoms, being more resilient and using more efficient coping styles.

To evaluate whether the depression variable accounted for significant additional variance in RTD above that associated with driving-related anxiety symptoms, a third hierarchical regression was run. To address this question, step 1 of model 1 was re-run (see above). Step 2 included the depression variable. Results of this analysis revealed that the regression model including depression was significant, $F(2,62) = 7.98$, $p = .0008$, but the inclusion of this variable contributed little additional explained variance in RTD, $R^2 = .179$. The change in R^2 by adding depression scores to the model was not significant, $F(1,62) = 2.01$, $p = .16$.

Statistical assumptions for step 1 of both model 1 and model 2 linear regressions were run, including normality, linearity, and homoscedasticity. Normality was assessed using the Shapiro-Wilk's test, which revealed a significant p-value ($p < .0001$) for model 1 and model 2 ($p < .0001$). However, the Q-Q plots for both models showed that the points fell approximately along the reference line, indicating that normality could be assumed. Linearity was assessed using the Tukey test, which yielded a non-significant p-value for model 1 ($p = .26$) and model 2 ($p = .65$). Though the removal of significant outliers can often correct for violations of linearity, this proposed fix incorporates greater researcher degrees of freedom. Recognizing this trade-off, and in favour of including the full dataset, outliers were not removed, and further statistical corrections were not made. Homoscedasticity was assessed using the non-constant variance test. The test yielded nonsignificant p - values associated with both model 1 (p = .11) and model 2 (p = .21), supporting the homoscedasticity assumptions being met for both models.

Of primary interest was whether coping ability and/or resilience were significantly associated with RTD in patients with mTBI. To address these goals, logistic regressions were run testing the associations between coping styles and resilience on RTD outcomes. Results of these analyses did not support any associations (data not shown). We next aimed to assess any differences between individuals who did or did not RTD on our primary variables. Results of these analyses are summarized in Table 6. Overall, patients who did not RTD had significantly higher driving-related anxiety and depression scores compared to patients who did. However, no significant differences emerged for coping styles (Task-Oriented, Emotion-Oriented, and/or Avoidance-Oriented) amongst those who did or did not RTD. Resilience was assessed both as a continuous variable and a dichotomous variable. Resilience was dichotomized by patients with BRS scores higher than 4.3, and were classified as having "high resilience", and patients with scores below 2.99 were classified as having "low resilience." A chi-square analysis to assess differences in resilience classification between those who did and did not RTD was not significant, $X2(1, N = 65) = .202$, $p = .653$.

Discussion

The present study evaluated whether mood, driving-related anxiety, coping style, and/or resilience were predictive of RTD in mTBI following an MVA. This novel work revealed that the presence of driving-related anxiety and depression predicted RTD. Moreover, and importantly, anxiety appeared to be an even greater limiting factor when considering RTD in this population. Interestingly, neither coping style nor resilience (whether presenting with low or normal [even high] resilience) predicted RTD as expected. Although there was some suggestion that TBI sufferers appear less resilient and rely on less efficient coping styles within the first post-injury injury. Age, gender, and education did not influence RTD. Finally, exploratory evaluation of the expression of symptomatology (i.e., over-endorsing symptom complaints) did not influence the outcomes.

The current work has revealed that health problems are, of themselves, an important consequence of TBI. Such issues appear common amongst mTBI sufferers; the extant research suggests that individuals with TBI are more likely to develop mental illness [81], that emotional distress appears to perpetuate over time, and that these problems are tied to future, TBI-related disability [82,83]. Moreover, psychological well-being gives rise to better quality of life and engagement in day-to-day activities, as research has indicated that poorer psychosocial, functional, and cognitive outcomes are related to neuropsychiatric disorders (i.e., anxiety and depression) [24,84].

RTD in the current work was associated with driving-

Table 6: T-test Results Comparing RTD on Primary Outcomes.

Outcome	RTD		No RTD		*t*- value	df	*p* value	95% CI		Cohen's d
	M	SD	M	SD				LL	UL	
Anxiety	44.77	16.35	59.91	13.95	3.90	48.83	.000	7.34	22.92	.97
Depression	22.74	11.81	30.36	10.63	2.66	46.62	.012	1.79	13.44	.67
Task Oriented Coping	49.67	12.48	51.36	17.27	.41	32.80	.69	-6.76	10.15	.12
Emotion Oriented Coping	55.40	10.91	56.45	8.55	.42	52.55	.67	-3.93	6.03	.10
Avoidance-Oriented Coping	43.48	12.13	45.64	13.50	.63	38.97	.53	-4.78	9.10	.17
Resilience	14.48	3.83	13.23	4.81	-1.05	35.25	.30	-3.65	1.15	.30

related anxiety and depressive symptoms, and in fact, anxiety played a greater role in predicting RTD, irrespective of time since injury (i.e., presenting with symptomatology within the first post-injury or beyond this time frame). Driving is an important part of individual independence and reintegration into the community. Moreover, mood may increase driver vulnerability and risk safe driving by negatively impacting cognition (i.e., contributing to difficulty with attention/ concentration and can create slowed reactions), increasing levels of sleepiness, in addition to possibly causing panic, or impulsive/ aggressive driving. The current findings thus speak to the need to address driving concerns and/or driving fitness in patients with TBI and with mental health concerns.

Literature evaluating coping ability and/ or resilience in TBI (not including the evaluation of driving), and typically in moderate to severe cases [41,85] support the contributory role of these factors to TBI outcomes [43]; in mTBI [34]. Thus, it is perhaps surprising to find that there was no association between these variables and RTD as anticipated in the current TBI population. Having said this, to our knowledge, no published research to date has examined the relationship between coping style, resilience, and driving-related anxiety in mTBI post-MVA. Along similar lines, some research has indicated no differences in coping style between those with TBI and healthy controls [42,43]. Krpan, et al. [41] evaluated coping behaviour in a moderate to severe group of patients with TBI as compared to control participants and found that the TBI group engaged in more avoidant than planful behaviours when measured stress level was comparable between the groups. (The controls displayed the opposite pattern of performance). Interestingly, when looking more closely at the group of interest, it was shown that 2/3rd of the sample could be classified as "avoidant" while the other fell into the "planful" category. In the present study, among the mTBI sufferers, coping style and resilience did not contribute to or differentiate between those who had and had not RTD. Based on the work carried out by Krpan, et al. [41], it may be important to consider in the future how groups are defined and the method of evaluation; that is, the usage of behaviour measures versus self-report measures may infer more sensitivity in detecting differences in coping style and resilience.

Along similar lines, evaluation of the style of coping (e.g., avoidance, rumination, worry, self-blame, self-medicating with drugs and alcohol) may lend itself to a better understanding more about adaptive coping styles; the work in mTBI is sparse and to date, the relationship among different coping styles and emotional adjustment [30,43], and the assessment of these associations in the context of RTD, is nonexistent in the extant literature. Interestingly, a recent review of fourteen studies in spinal cord injury [86] shared that coping resources contribute to emotional adjustment and self-worth, and perception of the situation and ability to manage illness. Further exploration to identify and enhance adaptive types of coping styles in TBI could mitigate stress events and contribute to recovery.

Although RTD was not evaluated in the study by Wardlaw, et al. [19], it was found that resilience contributed to 'participation' (as related to social relationships and leisure activities), and that those with greater resilience had better emotional adjustment five years post-TBI (severity ranged from mild to severe). Moreover, depression mediated the relationship between resilience and participation, while anxiety was not a significant moderator. There was a suggestion by Wardlaw and colleagues [19] that the acute post-injury period may differentially involve depression and anxiety and that mood changes over the course of recovery following TBI, influencing adaptation to adversity and the resumption of important life roles. Hence, along these lines, but in light of the importance of the presence of anxiety, the current findings may support the premise that earlier in the course of recovery, anxiety symptoms influence whether reengagement in driving following an MVA will occur. Whether the presence of anxiety and depression declines post injury needs to be tempered by the fact that injury severity, level of resilience, community participation, and family support, amongst other factors [85], appears to contribute to functional outcome [19]. Nevertheless, it appears imperative that psychoeducation and the implementation of psychological interventions be employed to address the emergence of anxiety (over the [possible] presence of depressive symptomatology), and earlier within the rehabilitation process. CBT interventions effectively target emotional difficulties in TBI [87,88].

A body of literature that is gaining some attention although still in its infancy, is that targeting positive psychological traits (e.g., coping, resilience, optimism) in treatment for TBI [89]. Even though there has been some current work directed at the enhancement of coping in treatment, the studies reviewed were underpowered with limited generalizability. Moreover, possible evidence of improvement in adaptive coping in TBI was not sustained [90].

This study has many strengths, including the evaluation of mTBI in a rather equal number of men and women. Moreover, all study participants had no pre-existing psychopathy and were functioning adequately pre-injury. All measures evaluated have been employed with the TBI population and shown to have good reliability. The current sample size, however, is modest, which may have affected the strength of the results. Moreover, the correlational design does not infer causation, and as such, in addition to the collection of a larger, independent sample, a control group for comparison may be warranted.

To mention, the extant literature has focused to a far greater extent on more severe injury. To better extrapolate results to the TBI population, mild to severe patients with TBI could be considered for future study inclusion, which may help clarify the role that coping and/or resilience play in RTD outcomes.

Lastly, we explored whether the extent of symptom reporting influenced RTD. In this instance, it had not. We used a standalone screening measure; perhaps the inclusion of other symptom validity tests is encouraged to rule out the influence of symptom reporting on RTD, coping, and resilience styles.

Conclusion

This novel research has demonstrated that the presence of depressive symptoms and anxiety, and in particular, driving-related anxiety, contributes to whether patients with mTBI RTD, irrespective of time since injury, age, and gender. Coping styles and resilience did not predict RTD. Further work is warranted to address the paucity of research investigating RTD parameters that contribute to and/or hinder RTD among mTBI sufferers. The ability to drive supports autonomy, and in turn, bolsters emotional well-being and hence, quality of life.

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