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The Effect of Terminology Relating to mTBI on Symptom and Recovery Expectations

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THE EFFECT OF TERMINOLOGY RELATING TO MTBI ON SYMPTOM AND

RECOVERY EXPECTATIONS

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The terms mild traumatic brain injury (mTBI) or concussion may evoke different expectations for people who sustain such an injury. Expectations are important because previous researchers have demonstrated that expected symptoms at the time of injury were the best predictors of actual symptoms post-injury. The current study investigated the effect of terminology on various outcome expectations. Participants also reported their familiarity with the terminology. Participants read a vignette depicting a person sustaining an mTBI in a motor vehicle accident. A relevant diagnosis – concussion or mTBI – was relayed at the end of the vignette. No diagnosis was relayed for the control group. The results demonstrated that there was an effect of terminology on expected symptoms, $F(2, 129) = 3.17$, $p = .045$. Post-hoc analyses revealed that "concussion," relative to no diagnosis, was associated with greater expected symptoms. There was no effect of terminology on expected length of recovery timeline, self-efficacy to control the symptoms and recovery of the injury, consequences of the injury, negative changes in life perspective, or undesirability of the injury. There was an effect of terminology on expected positive changes in life perspective, $H(2) = 6.38$, $p = .04$. Post-hoc analyses revealed that "mTBI," relative to no diagnosis, was associated with greater positive changes in life perspective. Participants were more familiar with "concussion" relative to "mTBI," but greater familiarity had no effect on expectations. Findings from this study reveal that there is a substantial lack of clarity surrounding brain injuries, and terminology evokes quite varied expectations on different people.

The Effect of Terminology Relating to mTBI on Symptom and Recovery Expectations

The consequences of traumatic brain injury (TBI), including mild traumatic brain injury (mTBI or concussion), are receiving an increasing amount of both media and research attention, especially for the athlete (Belson, 2013; Cassidy et al., 2004) and military populations (Zoroya, 2013; Hoge, 2008). This attention is warranted, as TBI is a major public health concern: approximately 1.7 million TBI cases occur each year in the U.S. (~506 per 100,000 people); 52,000 are fatal, 275,000 result in hospitalizations, and 1.3 million are treated in emergency care settings (Centers for Disease Control and Prevention [CDC], 2010). The young (less than 24 years) and the old (65 years and older) have the highest rates of TBI and males consistently sustain TBI at higher rates than females in all age groups. In the civilian population, falls are the leading cause of TBI while motor vehicle accidents (MVA) are the leading cause of TBI-related death. Alcohol-related accidents and playing contact sports are typically the cause of repeated head injuries. The societal costs are substantial with 5.3 million people suffering from TBI-related long-term disabilities. TBI accounts for one third of all injury-related deaths, and incurs direct and indirect costs upwards of an estimated $76.5 billion.

Approximately 75% of all TBIs fall on the mild end of the injury-severity spectrum ("mTBI") and many cases are never evaluated by healthcare providers; making the diagnosis and management of mTBIs in the general population challenging. Another complication to the diagnosis of mTBI is the abundance of terms and definitions referring to the injury. The popular media saturates the general public with news stories about "concussions" (Associated Press, 2013; Belson, 2013); people refer to the injury colloquially as having "had their bell rung;" the research community and some health care professionals refer to the injury as "mTBI" (Kempe, Sullivan, & Edmed, 2013; DeMatteo et al., 2010), or as a "minor head injury" (Weber &

Edwards, 2010). Though the terms are used interchangeably (Bigler, 2008), each term may convey different meanings about the symptoms and severity of the injury.

Part of the confusion surrounding the nomenclature of mTBI stems from the injury's many nebulous definitions. The CDC (2010) defines an mTBI as trauma to the head that changes the way the brain normally functions. Further, an individual who has sustained an mTBI will score between 13 and 15 points on the Glasgow Coma Scale – a widely used scale that assesses level of consciousness after a head injury with higher scores indicating better functioning. While this broad definition is generally accepted, more specific definitions have been contested. There is no universal definition of mTBI, as confusion arises around what warrants a diagnosis including the duration of the loss of consciousness, the duration of the subsequent altered mental state, the duration of post-traumatic amnesia, and whether structural damage should be detected by neuroimaging (Bigler, 2008). If a patient is diagnosed with an mTBI, the person may experience a sequela of cognitive, emotional, and physical symptoms such as difficulty thinking clearly, headaches and dizziness, irritability, and sleep disturbances (CDC, 2010).

DeMatteo et al. demonstrated the ambiguous nature of the diagnosis in a 2010 study. The researchers evaluated the clinical factors that lead to the diagnosis of a concussion regardless of existing formal definitions in a sample of brain-injured children admitted to a hospital. The researchers found that the term "concussion" – independent of GCS score and the presence of other associated symptoms – predicted both an earlier discharge from the hospital and a faster return to school compared to those who did not receive a concussion diagnosis. A normal CT scan and some loss of consciousness were associated with the greatest likelihood of receiving a concussion diagnosis. An abnormal CT scan resulted in a low chance of a concussion diagnosis. Among children with an abnormal CT scan, vomiting increased the chance, whereas disorientation decreased the chance of a concussion diagnosis. Though the authors did not indicate what term was used when a concussion diagnosis was not, it is clear that objective criteria could not reliably predict the diagnosis of concussion. DeMatteo et al. argue that clinicians may attempt to convey to parents that their child's injury is transient by using the less-alarming term "concussion." The researchers suggest that hospital clinicians experience the same pervasive lack of clarity when diagnosing the injury.

While the scientific and medical communities would certainly benefit from a standard definition of mTBI, it is becoming clear that more than neurological factors affect symptomatology and the subsequent outcome of the injury. Non-neurological variables such as a patient's expectations of symptoms play an important role in the course of mTBI recovery. Much like stereotype threat, "diagnosis threat" – a term coined by Suhr and Gunstad (2002) – involves worse cognitive performance for people who have sustained an mTBI after they are reminded that cognitive impairment may follow a head injury. The researchers argue that this worse performance occurs because neuropsychological tests are actually a measure of the behavioral correlates of brain functioning and do not directly measure brain functioning itself. Suhr and Gunstad (2002) demonstrated that relative to people who were not reminded of their history of mTBI, people who were reminded of it performed worse on general intellect and memory measures. Further, those in the diagnosis threat group self-reported that they put forth less effort on the cognitive tests. The researchers suggest that increased anxiety and/or decreased effort related to negative expectations activated by diagnosis threat account for the decreased cognitive performance.

Similarly, other researchers have demonstrated that educational level accounted for 11%, age accounted for 4%, and effort accounted for 53% of the variance in neuropsychological performance (Green, Rohling, Lees-Haley, & Allen, 2001). If negative expectations related to diagnosis can affect the behavioral manifestations (or symptoms) of mTBI, it is arguable that these same expectations can affect recovery from mTBI. In fact, some researchers have demonstrated that expected long-term symptoms assessed at the time of mTBI were the best predictors of actual symptoms 3 months post-injury (Whittaker, Kemp, & House, 2007). Approximately 80% of individuals who suffer one mTBI make a complete recovery within 3 months (Iverson, Zasler, & Lange, 2007); thus, a possible factor extending the recovery for some individuals may be these negative expectations.

Altering negative perceptions may be an intervention for preventing long and complicated recovery following mTBI. Since there are many terms for mTBI, careful use and explanation of terminology to patients by healthcare providers at the time of injury may be imperative for successful recovery. There are a handful of researchers who have evaluated the effect of differing terminology surrounding mTBI on people's expectations of symptoms. Prior to their 2011 study, McKinlay, Bishop, and McLellan used a Google search term of "concussion" to find a wealth of incongruent information. McKinlay et al. suggested that the general public is exposed to confusing and inaccurate information regarding mTBIs, associated symptoms, and when to seek medical attention. Thus, they evaluated public knowledge of the terms "brain injury" and "head injury" and evaluated whether these terms were differentially associated with various personality attributes. The researchers found that terminology was related to different character attributions for a brain-injured person. Relative to "head injury," the term "brain injury" was more likely to be associated with the words: kind, distractible, eager, diligent, and negative. It appears that an individual with a "brain injury" is judged more negatively than a person with a "head injury." Interestingly, approximately 60% of those who had reported that they sustained an mTBI stated that they had suffered a concussion but had not experienced a brain or head injury. Further, the researchers found that substantial uncertainty surrounds mTBI information. Participants, for example, were uncertain whether suffering a concussion as a young child or as an adult resulted in better recovery. Participants could not confidently endorse 40% of the statements as accurate or inaccurate.

In a similar study, Weber and Edwards (2010) evaluated the effect of diagnostic terms – mTBI, concussion, and minor head injury – on university athletes' familiarity with the terms and their perceptions of symptoms and expected outcomes. It could be assumed that those involved in sports may have a better understanding of mTBI than the general population, possibly due to more personal experience with mTBI or more exposure to mTBI education. Weber and Edwards, however, demonstrated that the term "mTBI" was consistently associated with the least familiarity and the most negativity relative to the other terms. Specifically, participants expected that mTBI would be a longer lasting injury that may not involve a complete recovery, may leave a person with learning difficulties and depression symptoms, and may make a person more susceptible to other similar injuries.

As research in this field is gaining momentum, Kempe, Sullivan, and Edmed (2013) argue that the results of the previous studies are not generalizable, as the studies do not reproduce the typical patient experience for someone who has suffered an mTBI. Since the majority of mTBI incidents are treated in hospital settings, Travender et al. (2011) suggest that the best practice for mTBI management in the emergency department involves providing patients with written discharge advice outlining the recovery experience. Thus, Kempe et al. (2013) attempted to re-create the typical patient experience by comparing the effect of the different diagnostic terms, "mTBI" versus "concussion," embedded in discharge advice brochures.

Contrary to the researchers' hypotheses, the term "mTBI" was not associated with greater symptomatology or worse expected outcomes. On the contrary, the term "concussion" was associated with greater expected post-concussion syndrome (PCS) symptomatology – cognitive and sensory symptoms, in particular – as evaluated by the Neurobehavioral Symptom Inventory (NSI; Cicerone & Kalmar, 1995).

The same researchers completed another study that investigated the effects of varying diagnostic terminology – concussion, mTBI, and minor head injury – on expected PCS and post-traumatic stress disorder (PTSD) symptoms (Sullivan, Edmed, & Kempe, 2014). Though there was no effect of terminology on expected PCS symptoms, PTSD symptoms were expected to be worse for those who experienced an mTBI and for those who did not receive an injury diagnosis, relative to concussion. Mild traumatic brain injury and no diagnosis were rated as more negative than concussion. Further, mTBI was rated as less desirable than both concussion and minor head injury. Sullivan et al. suggest that terminology is related to expected poorer outcomes; however, a clear relationship between terminology and these expectations has yet to be consistently demonstrated.

The results of these studies demonstrate that there is an effect of negative expectations surrounding mTBI, but that further research is needed to elucidate the exact nature of this effect on symptoms and recovery. In particular, these researchers evaluated participants' symptom expectations for a duration of 6 months after the mTBI. Only a minority of people who sustain an mTBI experience symptoms for greater than 3 months; thus, this time frame does not reflect an accurate recovery for the majority of mTBIs. Further, this time frame does not capture an important predictor variable of actual mTBI symptoms: expectations *at the time of injury*. In addition, researchers of previous studies have not evaluated the effect of terminology on positive expected outcomes and self-efficacy (i.e., confidence in one's ability) to manage the injury.

The current study investigated the effect of mTBI terminology on expected symptoms, consequences, self-efficacy, recovery, and negative and positive changes in life perspective for two weeks following mTBI. The perceived desirability of the injury, along with familiarity with the terminology was assessed. The hypotheses of the study were:

Hypotheses Related to Perceived Neurological Symptoms

1) The term "mTBI" will have greater perceived neurological symptoms (e.g., dizziness, forgetfulness, feeling anxious or tense, etc.) as measured by higher total scores on the Neurobehavioral Symptom Inventory (NSI) compared to "concussion." The term "concussion" will have greater perceived neurological symptoms as measured by higher total scores on the NSI compared to no diagnosis.

Hypotheses Related to Illness Perception

2) The term "mTBI" will have longer expected recovery as measured by higher total scores on the recovery timeline subscale of the Revised Illness Perception Questionnaire (IPQ-R) compared to "concussion." The term "concussion" will have longer expected recovery as measured by higher total scores on the recovery timeline subscale of the IPQ-R compared to no diagnosis.

3) The term "mTBI" will have greater expected consequences as measured by higher total scores on the consequences subscale of the IPQ-R compared to "concussion." The term "concussion" will have greater expected consequences as measured by higher total scores on the consequences subscale of the IPQ-R compared to no diagnosis.

4) The term “concussion” will have greater expected self-efficacy to control the symptoms and recovery of the injury as measured by higher total scores on the control/cure subscale of the IPQ-R compared to “mTBI.” The term “mTBI” will have greater expected self-efficacy to control the symptoms and recovery of the injury as measured by higher total scores on the control/cure subscale of the IPQ-R compared to no diagnosis.

Hypotheses Related to Expected Changes in Life Perspective

5) The term “mTBI” will have more expected negative changes in life perspective as measured by higher total scores on the negative scale (CiON-S) of the Changes in Outlook Questionnaire – Short Form (CiOQ-S) compared to “concussion.” The term “concussion” will have more expected negative changes in life perspective as measured by higher total scores on the negative scale (CiON-S) of the CiOQ-S compared to no diagnosis.

6) The term “concussion” will have more expected positive changes in life perspective as measured by higher total scores on the positive scale (CiOP-S) of the CiOQ-S compared to “mTBI.” The term “mTBI” will have more expected positive changes in life perspective as measured by higher total scores on the positive scale (CiOP-S) of the CiOQ-S compared to no diagnosis.

Hypotheses Related to Perceived Undesirability of Injury

7) The term “mTBI” will have more perceived undesirability as measured by higher total scores on the Undesirability of Injury measure compared to “concussion.” The term “concussion” will have more perceived undesirability as measured by higher total scores on the Undesirability of Injury measure compared to no diagnosis.

Hypotheses Related to Familiarity with Terminology

8) The term "concussion" will have more familiarity as measured by higher total scores on the Familiarity with Terminology measure compared to "mTBI." Finally, there will be a positive relationship between higher total scores on the Familiarity with Terminology measure and scores on the NSI, the timeline, control/cure, and consequences subscales of the IPQ-R, the CiOQ-S, and the Undesirability of Injury measure.

Method

Participants

A total convenience sample of 278 undergraduate participants between the ages of 18 and 56 (M = 20.8, SD = 5.52) was collected during three designated screening days at the beginning of each semester, as well as throughout the semester at a medium-sized university in the northwestern United States. These participants received 1 credit towards an eligible psychology course. All participants who opted to participate in the study completed the questionnaires, but were subsequently excluded from the sample if they reported birth difficulties (n = 4) or current learning difficulties (n = 2), neurological impairments (n = 0), current psychological symptoms or endorse possible problems with drug or alcohol use (n = 4), or have a history of TBI (n = 65). Participants were also excluded for reporting that they did not understand the instructions of the study (n = 1) and for failing the Manipulation Check of the Motor Vehicle Accident Vignette content (n = 41). A total of 146 participants were excluded from the final data set and resulted in unequal sample sizes for each condition.

Of the remaining sample (n = 132), 28% were male (n = 37) and 72% were female (n = 95), which represented the typical proportion of genders for a psychology class at this university. Eighty-four percent (n = 114) of the final sample were Caucasian, 3% (n = 4) were American Indian, Native American, or Alaskan Native, 3% (n = 4) were biracial, 1.5% (n = 2) were Native

Hawaiian or another Pacific Islander, 1.5% (*n* = 2) were Asian, 1.5% (*n* = 2) were Hispanic/Latino, and 0.8% (*n* = 1) were Arabic. The mean reported GPA for the sample was 3.35.

Materials

Neuropsychological Lab Screening Form

The screening questionnaire included questions regarding the participant's age, gender, ethnicity, education, and history of TBI. The questionnaire included questions regarding the participant's developmental, psychological, and neurological health (see *Appendix A*).

Motor Vehicle Accident Vignette

The vignette used in this study was modeled after Sullivan, Edmed, and Cunningham's (2013) vignette. The injury depicted in this vignette corresponds to the World Health Organization's diagnostic criteria for mTBI. The vignette depicted a blunt force to the head with subsequent loss of consciousness of less than 30 min, post-traumatic amnesia for less than 24 hrs, and a Glasgow Coma Scale score of 13-15 after 30 min post injury (Carroll, Cassidy, Holm, Kraus, & Coronado, 2004; see *Appendix B*). This vignette has been used in previous studies evaluating expectations surrounding mTBI (Sullivan et al., 2014; Kempe et al., 2013). Like the Sullivan et al. (2014) study, an additional sentence conveyed the relevant diagnosis at the end of the vignette (i.e., "Based on your injury, you were given a diagnosis of a concussion [mild traumatic brain injury]"). The final sentence in the vignette for the control condition conveyed no relevant diagnosis (i.e., "Based on your injury, you were not given any diagnosis").

Neurobehavioral Symptom Inventory

The Neurobehavioral Symptom Inventory (NSI; Cicerone & Kalmar, 1995) is a self-report measure that assesses 22 post-concussive symptoms over a 2-week period.

Somatic/sensory (e.g., loss of balance, feeling dizzy, etc.), affective (e.g., feeling anxious or tense, etc.), and cognitive (e.g., poor concentration, forgetfulness, etc.) symptoms are evaluated. Each item is rated on a 5-point Likert scale ranging from 0 (“None – Rarely if ever present; not a problem at all”) to 4 (“Very Severe – Almost always present and I have been unable to perform at work, school or home due to this problem; I probably cannot function without help”; see *Appendix C*). Responses to items are summed so that high scores on the scale represent greater symptomatology. The wording of the questionnaire was modified to reflect that the participant should respond to the items based on their expectations (i.e., “Based on the vignette you just read, please rate the following symptoms [with regard to how much you think they will disturb you in the TWO WEEKS following the injury]”).

The NSI is frequently used to assess TBI symptoms in veterans of the United States military (Wilde et al., 2010). The scale shows high internal consistency (Cronbach’s alpha = 0.95), is able to discriminate between veterans with and without a history of TBI (King et al., 2012), and has been used in previous studies evaluating expectations surrounding mTBI (Sullivan et al., 2014; Kempe et al., 2013). Researchers have recently found that a 20-item four factor model (i.e., somatic, affective, cognitive, and vestibular) best explains the variance of the NSI and is better able to discriminate among clinical populations (Meterko et al., 2012; Vanderploeg et al., 2015). Thus, two items were removed (i.e., loss of appetite or increase in appetite and hearing difficulties) and the four factor model was used to analyze this data. The total score for the NSI ranges from 0 to 80, with higher scores indicating greater amount of post-concussive symptoms.

Illness Perception

The Revised Illness Perception Questionnaire (IPQ-R; Moss-Morris et al., 2002) is a self-report measure that assesses five components of illness perceptions: identity, consequences, timeline, control/cure, and cause. Three of the subscales – timeline, control/cure, and consequences – were used in this study. These subscales are rated on a 5-point Likert scale ranging from 1 (“Strongly Disagree”) to 5 (“Strongly Agree”). The timeline subscale has six items that evaluate the respondent’s perception of recovery timeline. Three items of this subscale are reverse scored. The raw score for the timeline subscale ranges from 6 to 30, with higher scores indicating longer length of recovery. The control/cure subscale has six items that evaluate the respondents’ perceptions of their ability to control the symptoms and/or outcome of the injury. Two items on the control/cure subscale are reverse scored. The raw score for the control/cure subscale ranges from 6 to 30, with higher scores indicating greater personal ability to control symptoms and recovery. The consequences subscale has six items – three are reverse scored – that evaluate the respondent’s perceptions about the broader life impact of the injury. The raw score for the consequences subscale ranges from 6 to 30, with higher scores indicating greater broader life impact. The items for each of the subscales are summed. The wording of the subscales was modified from “illness” to “injury” and was modified to reflect expectations for this study (i.e., “My illness will last a short time” was modified to “[I expect that] my [injury] will last a long time”; see *Appendix D*).

The IPQ-R demonstrates good psychometric properties on a variety of patient populations. The subscales of the IPQ-R demonstrate good internal consistency (Cronbach’s alpha ranging from 0.79 to 0.89) and show stable test-retest reliability over a 3-week period for renal dialysis inpatients (r = 0.46 – 0.88; Moss-Morris et al., 2002). The scale has been used in previous studies evaluating expectations surrounding mTBI (Sullivan et al., 2014; Kempe et al., 2013).

Changes in Outlook Questionnaire – Short Form (CiOQ-S)

The Changes in Outlook Questionnaire Short Form (CiOQ-S; Joseph, Linley, Shevlin, Goodfellow, & Butler, 2006) is a 10-item self-report measure that assesses both positive and negative changes in life perspective after experiencing a negative life event. The positive component of this measure provides a full spectrum of respondents' expectations surrounding mTBI, a neglected construct in previous studies evaluating the effect of mTBI terminology on expectations. The CiOQ-S is comprised of the 10 items with the highest factor loadings from the longer, 26-item CiOQ (Joseph, Williams, & Yule, 1993; Joseph et al., 2006). Each item is measured on a 6-point Likert scale ranging from 1 ("Strongly Disagree") to 6 ("Strongly Agree"). The raw score for the positive subscale ranges from 5 to 30, with higher scores indicating greater positive changes in life perspective. The raw score for the negative subscale ranges from 5 to 30, with higher scores indicating greater negative changes in life perspective. The wording of the questionnaire was modified to reflect that the participant should respond to the items based on their expectations (i.e., "Based on the vignette you just read, [think about how you would feel about your life within the TWO WEEKS after the injury]"; see *Appendix E*).

Both the positive (CiOP-S) and negative (CiON-S) scales of the CiOQ-S demonstrate satisfactory internal consistency (Cronbach's alpha of 0.78 and 0.83, respectively; Joseph et al., 2006) and displays good convergent validity with the validated 26-item CiOQ (r = 0.93 for the positive scale and r = 0.89 for the negative scale; Joseph et al., 2006). Scores on the CiON-S correlated well with scores on a measure of post-traumatic stress in a clinical sample of people diagnosed with post-traumatic stress disorder, providing more evidence for the convergent validity of the CiOQ-S (r = 0.61; Joseph et al., 2006).

Undesirability of Injury

Expectations of symptoms and recovery may be influenced by perceptions of undesirability of the injury. Participants rated a 1-item measure (“How undesirable would you find such an experience?”) using a 5-point Likert scale ranging from 1 (“Not at all undesirable”) to 5 (“Extremely undesirable”; see *Appendix F*). This measure has been used in previous studies evaluating expectations surrounding mTBI and was a valid measure for determining perceived desirability of injuries (Sullivan et al., 2014). There are no other psychometric properties available for this measure.

Familiarity with Terminology

It is possible that expectations surrounding different mTBI terminology may be influenced by the participant’s familiarity with the term. If participants have never heard of the term, it is likely they will not have specific and/or accurate expectations about it. Thus, a 2-item measure assessed for familiarity with terminology. The first item measures familiarity with the “mTBI” term using a 5-point Likert scale ranging from 1 (“Not at all familiar”) to 5 (“Extremely familiar”). If the respondent was familiar with the term, the respondent indicated the source of the familiarity (i.e., personal injury history, observed in significant others, media, studies/work, and an open-ended question to indicate another source not listed; see *Appendix G*). This measure was not included with the no diagnosis (control) group. This questionnaire was previously used in a study evaluating expectations surrounding mTBI and was a valid measure for determining familiarity with terminology (Weber & Edwards, 2010). There are no other psychometric properties available for this measure.

Manipulation Check

A Manipulation Check questionnaire was used to assess compliance and comprehension of the MVA vignette instructions and content. Two dichotomous (“yes” or “no”) items assess compliance with instructions (i.e., “did you understand the instructions provided in this study?” and “did you forget to put yourself in the position of the character described in the accident while answering any of the symptom items?”). Three open-ended items assess comprehension of the content of the vignette (i.e., “In the story, for how long did the character lose consciousness?” “In the story, how long did the character stay in the hospital?” and “In the story, what was the character’s memory recall like after the accident?”). Two questions assess the participants’ effort and perceived success for following the instructions of the study using a 10-point Likert scale ranging from 1 (“Didn’t try at all” or “Not at all successful”) to 10 (“Tried very hard” or “Very successful”). A final question assesses the participant’s memory of the diagnosis in the vignette (i.e., “Without looking at the vignette, what was your diagnosis in the vignette?”; see *Appendix H*).

If the first two questions were answered “no” and “yes,” respectively, the participant was excluded from the study. For the comprehension questions, if a participant’s response seriously deviated from the content of the vignette, the participant was excluded from the study. Serious deviations included the participant reporting a loss of consciousness for more than 30 min, a hospital stay for longer than 24 hrs, and serious and persisting memory impairments such as complete amnesia or memory deficits lasting longer than 24 hrs. Similarly, if a participant reported that either his or her effort at following the instructions of the study or his or her success at producing the requested results was 3 or below, the participant was excluded from the study. For the final question, if participants’ recall of the diagnosis in the vignette did not match the condition that they were in, they were excluded from the study. This questionnaire was used in previous studies evaluating expectations surrounding mTBI and was a valid measure for assessing compliance and comprehension of vignette instructions and content (Sullivan et al., 2014). There are no other psychometric properties available for this measure.

Procedure

Prior to the start of the study, packages of questionnaires including a vignette depicting a motor vehicle accident were assembled and placed in envelopes by research assistants. Each envelope contained one vignette with different mTBI terminology – mTBI or concussion – or a vignette that did not contain mTBI terminology. The group that received the packet without terminology (i.e., the no diagnosis group) served as the control. The demographic questionnaire and vignette were completed first. The order of the other questionnaires (i.e., the NSI, IPQ-R, CiOQ-S, Undesirability of Injury, and Familiarity of Terminology) was counter-balanced using a Latin Square. The Manipulation Check was completed last. Participants were randomly assigned to either a control condition or one of two experimental conditions: a mild traumatic brain injury (mTBI) terminology group or a concussion terminology group. The control group did not receive a diagnosis.

Participants were randomly assigned to one of three groups. Groups of participants participated in the study either in a classroom during a designated screening day at the beginning of the semester, or in a designated research room and completed the task in private during the semester. At the time of the study, the researchers presented a letter of informed consent to the participants. Participation was voluntary and participants were able to drop out of the study at any time without penalty. After the participant read and signed the letter of informed consent, the researcher gave an envelope to the participant. Since designated research assistants assembled the questionnaire packages, the researcher and other research assistants were blind to the conditions, as they did not know the contents of the envelope.

Results

The Effect of Terminology on Expectations

A one-way Analysis of Variance (ANOVA) revealed a significant difference in total NSI score due to the terminology groups, $F(2, 129) = 3.17$, $p = .045$, $\eta^2 = .05$. Follow-up tests were conducted to evaluate pairwise differences among the means using Gabriel's test. The participants exposed to the "concussion" terminology reported significantly higher total scores on the NSI compared to participants exposed to the no diagnosis condition. There was no significant difference in total NSI scores between the "mTBI" terminology and the "concussion" terminology. In addition, there was no significant difference in total NSI scores between the "mTBI" terminology and the no diagnosis condition. The results, along with the means, standard deviations, and confidence intervals for the three terminology conditions, are reported in Table 1.

Table 1

Descriptive and Inferential Statistics for the NSI Total Score

Terminology	*n*	*M (SD)*	95% CI	*F*	*p*	η^2
mTBI	54	27.44 (16.37)	[22.98, 31.91]			
Concussion	37	34.14 (15.53)	[28.96, 39.31]	3.17	0.045*	0.05
No Diagnosis	41	25.71 (14.65)	[21.09, 30.33]			

Note. An asterisk (*) indicates significance at alpha = .05. The total raw score for the NSI ranges from 0 to 80, with higher scores indicating more expected post-concussive symptoms.

A one-way ANOVA revealed no significant differences in the recovery timeline subscale score of the IPQ-R due to the terminology groups, $F(2, 129) = 1.48$, $p = .23$, $\eta^2 = .02$. The results, along with the means, standard deviations, and confidence intervals for the three terminology conditions, are reported in Table 2.

Table 2

Descriptive and Inferential Statistics for the IPQ-R Recovery Timeline Subscale Score

Terminology	*n*	*M (SD)*	95% CI	*F*	*p*	η^2
mTBI	54	13.13 (4.86)	[11.80, 14.46]			
Concussion	37	13.00 (4.27)	[11.58, 14.42]	1.48	0.23	0.02
No Diagnosis	41	11.66 (3.81)	[10.46, 12.86]			

Note. An asterisk (*) indicates significance at alpha = .05. The raw score for the timeline subscale ranges from 6 to 30, with higher scores indicating longer anticipated length of recovery.

A one-way ANOVA revealed no significant differences in the control/cure subscale score of the IPQ-R due to the terminology groups, $F(2, 129) = 1.76$, $p = .18$, $\eta^2 = .03$. The results, along with the means, standard deviations, and confidence intervals for the three terminology conditions, are reported in Table 3.

Table 3

Descriptive and Inferential Statistics for the IPQ-R Control/Cure Subscale Score

Terminology	*n*	*M (SD)*	95% CI	*F*	*p*	η^2
mTBI	54	22.11 (3.27)	[21.22, 23.00]			
Concussion	37	21.30 (4.27)	[19.87, 22.72]	1.76	0.18	0.03
No Diagnosis	41	20.66 (3.91)	[19.42, 21.89]			

Note. An asterisk (*) indicates significance at alpha = .05. The raw score for the control/cure subscale ranges from 6 to 30, with higher scores indicating greater perceived personal ability to control symptoms and recovery.

A one-way ANOVA revealed no significant differences in the consequences subscale score of the IPQ-R due to the terminology groups, $F(2, 129) = 1.81$, $p = .17$, $\eta^2 = .03$. The results, along with the means, standard deviations, and confidence intervals for the three terminology conditions, are reported in Table 4.

Table 4

Descriptive and Inferential Statistics for the IPQ-R Consequences Subscale Score

Terminology	*n*	*M (SD)*	95% CI	*F*	*p*	η^2
mTBI	54	14.26 (4.26)	[13.10, 15.42]			
Concussion	37	13.03 (4.36)	[11.57, 14.48]	1.81	0.17	0.03
No Diagnosis	41	12.68 (4.20)	[11.36, 14.01]			

Note. An asterisk (*) indicates significance at alpha = .05. The raw score for the consequences subscale ranges from 6 to 30, with higher scores indicating greater perceived broader life impact.

Exploration of the data indicated that the parametric assumptions of normality and homogeneity of variance (Levene's Test of Equality of Error Variances, $F(2, 129) = 3.50$, $p = .03$) was breached for the CiOQ-S positive subscale score. Thus, a Kruskal-Wallis test revealed a significant difference on the CiOQ-S positive subscale score due to the terminology groups, $H(2) = 6.38$, $p = .04$, $r = -.15$. Follow-up Mann-Whitney *U* tests were conducted to evaluate pairwise differences among the means. The alpha level was set at $p = .016$ using a Bonferroni adjustment to account for the possible inflation of Type I error due to the multiple comparisons (.05 / 3 = .016). The participants exposed to the "mTBI" terminology reported significantly higher total scores on the CiOQ-S positive subscale compared to participants exposed to the no diagnosis condition. There was no significant difference between the "mTBI" terminology and the "concussion" terminology. In addition, there was no significant difference between the "concussion" terminology and the no diagnosis condition. In other words, participants in the "mTBI" and "concussion" groups endorsed expected positive changes in life perspective at similar rates. The results, along with the medians and confidence intervals for the three terminology conditions, are reported in Table 5.

Table 5

Descriptive and Inferential Statistics for the CiOP-S Score

Terminology	*n*	*Mdn (IQR)*	95% CI	*H*	*p*	*r*
mTBI	54	22.00 (7.00)	[20.85, 23.44]			
Concussion	37	22.00 (8.00)	[17.44, 21.69]	6.38	0.04*	-0.15
No Diagnosis	41	20.00 (6.50)	[18.25, 20.97]			

Note. An asterisk (*) indicates significance at alpha = .05. The raw score for the positive subscale ranges from 5 to 30, with higher scores indicating greater perceived positive changes in life perspective.

Exploration of the data indicated that the assumption of normality was seriously breached for the CiOQ-S negative subscale score. Thus, a Kruskal-Wallis test revealed no significant differences on the CiOQ-S negative subscale score due to the terminology groups, $H(2) = 2.65$, $p = .27$, $r = -.05$. The results, along with the medians and confidence intervals for the three terminology conditions, are reported in Table 6.

Table 6

Descriptive and Inferential Statistics for the CiON-S Score

Terminology	*n*	*Mdn (IQR)*	95% CI	*H*	*p*	*r*
mTBI	54	9.00 (5.00)	[8.87, 10.73]			
Concussion	37	8.00 (5.50)	[7.72, 10.50]	2.65	0.27	-0.05
No Diagnosis	41	8.00 (5.00)	[7.86, 9.95]			

Note. An asterisk (*) indicates significance at alpha = .05. The raw score for the negative subscale ranges from 5 to 30, with higher scores indicating greater perceived negative changes in life perspective.

A one-way ANOVA revealed no significant differences on the Undesirability of Injury score due to the terminology groups, $F(2, 129) = 1.33$, $p = .27$, $\eta^2 = .02$. The results, along with the means and confidence intervals for the three terminology conditions, are reported in Table 7.

Table 7

Descriptive and Inferential Statistics for the Undesirability of Injury Score

Terminology	*n*	*M (SD)*	95% CI	*F*	*p*	η^2
mTBI	54	3.94 (0.98)	[3.68, 4.21]			
Concussion	37	3.78 (1.06)	[3.43, 4.14]	1.33	0.27	0.02
No Diagnosis	41	3.61 (0.95)	[3.31, 3.91]			

Note. An asterisk (*) indicates significance at alpha = .05. The raw score for the Undesirability of Injury measure ranges from 1 to 5, with higher scores indicating greater perceived undesirability.

The Effect of Terminology on Familiarity of Terminology

Exploration of the data indicated that the parametric assumptions of normality and homogeneity of variance (Levene's Test of Equality of Error Variances, $F(2, 89) = 7.17$, $p = .009$) was breached for the Familiarity of Terminology score. Thus, a Mann-Whitney *U* test revealed a significant difference on the Familiarity of Terminology score due to the terminology groups (i.e., "mild traumatic brain injury" and "concussion"), $U = 395.00$, $z = -5.15$, $p < .001$, $r = -.54$. Participants reported significantly more familiarity with the term "concussion" than with the term "mTBI." The results, along with the medians and confidence intervals for the two terminology conditions, are reported in Table 8.

Table 8

Descriptive and Inferential Statistics for the Familiarity of Terminology Score

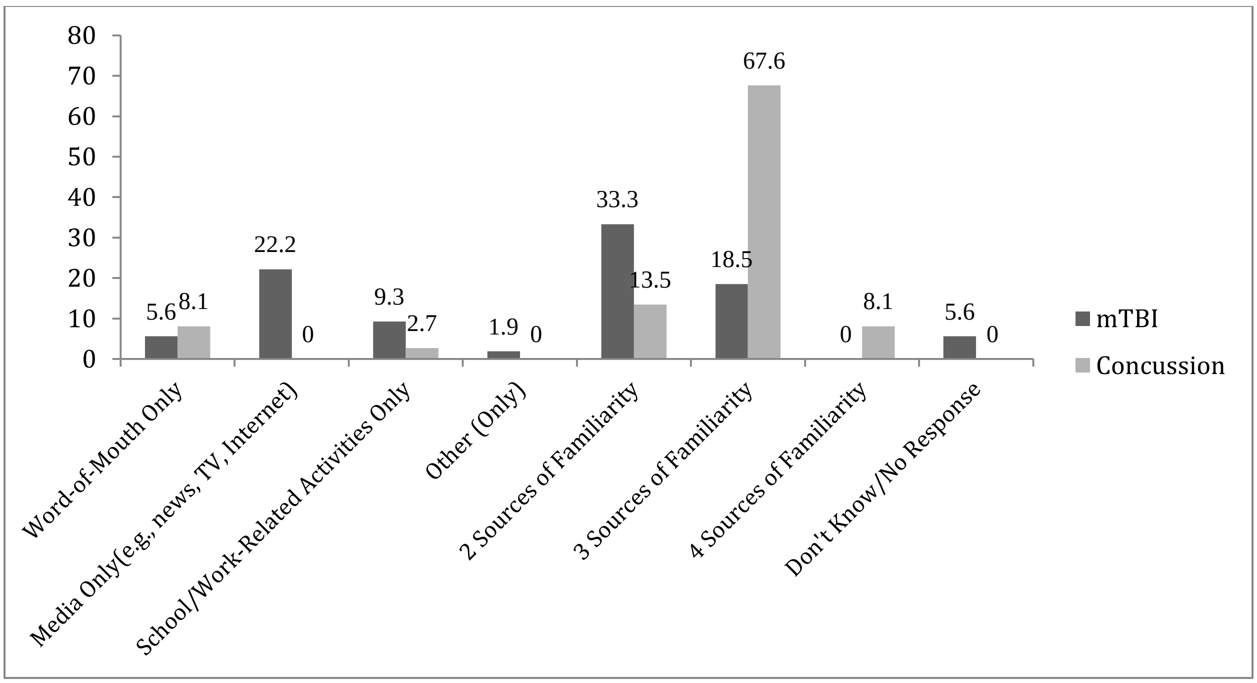
Terminology	*n*	*Mdn (IQR)*	95% CI	*U*	*p*	*r*
mTBI	54	1.00 (1.00)	[2.93, 3.48]	395.00	<0.001*	-0.54
Concussion	37	4.00 (1.00)	[4.07, 4.47]			

Note. An asterisk (*) indicates significance at alpha = .05. The raw score for the Familiarity of Terminology measure ranges from 1 to 5, with higher scores indicating greater familiarity with the terminology.

An examination of the data using a frequencies analysis indicated that 33.3% of the participants ($n = 18$) in the mTBI condition reported exposure to the term "mTBI" from two different sources (e.g., word-of-mouth, media including television or the Internet, or school- or work-related activities), 22.2% (*n* = 12) reported exposure to the term from media only, and 18.5% (*n* = 10) reported exposure to the term from three different sources. For the "concussion" condition, 67.6% (*n* = 25) of the participants reported exposure to the term from three different sources, 13.5% (*n* = 5) reported exposure to the term from two different sources, and 8.1% (*n* = 3) reported exposure to the term from four different sources of familiarity and from word-of-mouth only. The sources of familiarity for each terminology condition are reported in graph 1.

Graph 1

The Reported Sources of Familiarity for Participants in the "mTBI" and "Concussion" Conditions (% of Sample)



The Effect of Familiarity of Terminology on Expectations

A final set of analyses investigated the effect of the familiarity with the terminology on expectations, as measured by the seven dependent variables described above. In order to do this, scores on the Familiarity of Terminology variable were collapsed into two groups. The variable was originally a 5-point Likert scale ranging from no familiarity to a lot of familiarity. A rating of “1” (indicating no familiarity with the terminology) had a sample size of 3, a rating of “2” had a sample size of 9, a rating of “3” had a sample size of 23, a rating of “4” had a sample size of 39, and a rating of “5” (indicating a lot of familiarity with the terminology) had a sample of 17. This collapsing procedure was conducted due to variable and relatively small sample sizes across the levels of the variable. Using a rational process, ratings of less than or equal to “2” were recoded as “low familiarity” and ratings of greater than or equal to 4 were recoded as “high familiarity.” The low familiarity group had a sample size of 12 and the high familiarity group had a sample size of 56. These two groups were compared on each of the dependent variables.

Exploration of the data indicated that the parametric assumption of normality was breached for the NSI total score. Thus, a Mann-Whitney *U* test revealed no significant differences on the NSI total score due to the familiarity groups, $U = 272.50$, $z = -1.02$, $p = .31$, $r = -.12$. The results, along with the medians and confidence intervals for the two familiarity conditions, are reported in Table 9.

Table 9

Descriptive and Inferential Statistics for the NSI Total Score

Familiarity	*n*	*Mdn (IQR)*	95% CI	*U*	*p*	*r*
Low	12	25.00 (32.75)	[14.12, 40.04]	272.50	0.31	-0.12
High	56	29.00 (24.00)	[27.64, 35.89]			

Note. An asterisk (*) indicates significance at alpha = .05. The total raw score for the NSI ranges from 0 to 80, with higher scores indicating more expected post-concussive symptoms.

Exploration of the data indicated that the parametric assumption of normality was breached for the recovery timeline subscale score of the IPQ-R. Thus, a Mann-Whitney *U* test revealed no significant differences on the recovery timeline subscale score of the IPQ-R due to the familiarity groups, *U* = 315.50, *z* = -0.33, *p* = .74, *r* = -.04. The results, along with the medians and confidence intervals for the two familiarity conditions, are reported in Table 10.

Table 10

Descriptive and Inferential Statistics for the IPQ-R Recovery Timeline Subscale Score

Familiarity	*n*	*Mdn (IQR)*	95% CI	*U*	*p*	*r*
Low	12	11.00 (8.25)	[8.98, 16.52]	315.50	0.74	-0.04
High	56	12.00 (6.75)	[11.40, 13.70]			

Note. An asterisk (*) indicates significance at alpha = .05. The raw score for the timeline subscale ranges from 6 to 30, with higher scores indicating longer anticipated length of recovery.

An independent samples *t*-test revealed no significant differences on the control/cure subscale of the IPQ-R due to the familiarity groups, *t*(66) = -0.29, *p* = .78, η^2 = .0032. The results, along with the means and confidence intervals for the two familiarity conditions, are reported in Table 11.

Table 11

Descriptive and Inferential Statistics for the IPQ-R Control/Cure Subscale Score

Familiarity	*n*	*M (SD)*	95% CI	*t*	*p*	η^2
Low	12	21.58 (3.60)	[19.29, 23.87]	-0.29	0.78	0.0032
High	56	21.95 (4.05)	[20.86, 23.03]			

Note. An asterisk (*) indicates significance at alpha = .05. The raw score for the control/cure subscale ranges from 6 to 30, with higher scores indicating greater perceived personal ability to control symptoms and recovery.

Exploration of the data indicated that the parametric assumption of normality was breached for the score on the consequences subscale of the IPQ-R. Thus, a Mann-Whitney *U* revealed no significant differences on the consequences subscale score of the IPQ-R due to the familiarity groups, *U* = 335.00, *z* = -0.016, *p* = .99, *r* = -.002. The results, along with the medians and confidence intervals for the two familiarity conditions, are reported in Table 12.

Table 12

Descriptive and Inferential Statistics for the IPQ-R Consequences Subscale Score

Familiarity	*n*	*Mdn (IQR)*	95% CI	*U*	*p*	*r*
Low	12	13.00 (6.50)	[10.30, 16.70]	335.00	0.99	-0.002
High	56	13.00 (5.75)	[12.39, 14.76]			

Note. An asterisk (*) indicates significance at alpha = .05. The raw score for the consequences subscale ranges from 6 to 30, with higher scores indicating greater perceived broader life impact.

Exploration of the data indicated that the parametric assumption of normality was breached for score on the positive subscale of the CiOQ-S. Thus, a Mann-Whitney *U* test revealed no significant differences on the positive subscale score of the CiOQ-S due to the familiarity groups, $U = 290.00$, $z = -0.742$, $p = .46$, $r = -.09$. The results, along with the medians and confidence intervals for the two familiarity conditions, are reported in Table 13.

Table 13

Descriptive and Inferential Statistics for the CiOP-S Score

Familiarity	*n*	*Mdn (IQR)*	95% CI	*U*	*p*	*r*
Low	12	23.50 (11.00)	[17.98, 26.52]	290.00	0.46	-0.09
High	56	22.00 (6.00)	[19.67, 22.61]			

Note. An asterisk (*) indicates significance at alpha = .05. The raw score for the positive subscale ranges from 5 to 30, with higher scores indicating greater perceived positive changes in life perspective.

Exploration of the data indicated that the parametric assumption of normality was breached for score on the negative subscale of the CiOQ-S. Thus, a Mann-Whitney *U* test revealed that differences on the negative subscale score of the CiOQ-S approached significant differences due to the familiarity groups, $U = 228.50$, $z = -1.739$, $p = .08$, $r = -.21$. The results, along with the medians and confidence intervals for the two familiarity conditions, are reported in Table 14.

Table 14

Descriptive and Inferential Statistics for the CiON-S Score

Familiarity	*n*	*Mdn (IQR)*	95% CI	*U*	*p*	*r*
Low	12	11.00 (5.75)	[8.08, 14.25]	228.50	0.08	-0.21
High	56	8.00 (5.00)	[7.93, 9.92]			

Note. An asterisk (*) indicates significance at alpha = .05. The raw score for the positive subscale ranges from 5 to 30, with higher scores indicating greater perceived negative changes in life perspective.

An independent samples *t*-test revealed no significant differences on the Undesirability of Injury score due to the familiarity groups, $t(66) = -0.07$, $p = .95$, $\eta^2 = .00$. The results, along with the means and confidence intervals for the two familiarity conditions, are reported in Table 15.

Table 15

Descriptive and Inferential Statistics for the Undesirability of Injury Score

Familiarity	*n*	*M (SD)*	95% CI	*t*	*p*	η^2
Low	12	3.83 (1.03)	[3.18, 4.49]	-0.07	0.95	0.00
High	56	3.86 (1.09)	[3.57, 4.15]			

Note. An asterisk (*) indicates significance at alpha = .05. The raw score for the Undesirability of Injury measure ranges from 1 to 5, with higher scores indicating greater perceived undesirability.

Discussion

The results of this study did not support the first set of hypotheses as they related to expectations of post-concussive symptoms, recovery timeline, consequences of the injury, self-efficacy to control the symptoms and recovery of the injury, changes in life perspective, or undesirability of the injury. One of the hypotheses posited that the term “mTBI,” relative to “concussion” and no diagnosis, would be associated with greater expected post-concussive symptoms as measured by higher total scores on the Neurobehavioral Symptom Inventory (NSI). However, these results demonstrated that the participants expected worse symptoms for "concussion" relative to no diagnosis. This result corroborates Kempe et al.'s (2013) study which also found that people expected worse PCS symptomatology using the NSI with "concussion" relative to "mTBI." Kempe et al. posited that their results may have been influenced by the discharge advice brochure used in their study, in which the diagnostic terminology was embedded. That is, participants' expectations were recalibrated to more accurate conceptualizations of the injury based on the brochure information, and concussion symptom expectations were heightened and/or mTBI symptom expectations were reduced. The present study, along with Kempe et al.'s study, suggests that people's view of concussion at any given moment is subject to external forces, such as cultural and societal factors.

It could be that these results make intuitive sense considering the current societal, and especially media, attention on brain injuries, particularly in sports. There has been a recent and clear societal shift regarding brain injuries, which can be seen in policy and legislative changes for grassroots and high school-level sports (e.g., The Dylan Steigers Protection of Youth Athletes Act, 2013; Natasha's Law, 2011), high profile class-action law suits involving former football players in the National Football League (NFL; Belson, 2013; Almasy & Martin, 2015), and the December 25, 2015 release of the award-winning movie *Concussion*, which grossed $34.5 million worldwide at the box office (IMDb, 2016). It is noteworthy that the term "concussion" is used exclusively in these discussions. On the other hand, recall that Sullivan et al. (2014) found no effect of terminology ("concussion," "mTBI," and "minor head injury") on expected PCS symptoms. We suggest that this different terminology does actually evoke different expectations, and the variable results reflect individuals' mixed experiences and exposure with the terminology. Expectations will continue to be recalibrated, as the cultural spotlight intensifies on mTBIs in the following years. Further, expectations regarding post-concussive symptoms may be related to whether people are more familiar with the term “mTBI” or “concussion.”

As predicted by another hypothesis, participants were indeed more familiar with the term “concussion” compared to “mTBI.” This result corroborated the findings of Weber and Edwards’ (2010) study, which also found that people were most familiar with “concussion” compared to “mTBI” and “minor head injury.” The finding of the present study was strengthened by the result that participants reported exposure to the term “concussion” from more sources such as the media, academia, and work compared to “mTBI.” If people are not as familiar with the term “mTBI,” it is logical to think that their expectations about that injury will be less precise. However, the results showed that familiarity had no effect on participants’ responding on the NSI. People with high familiarity with the terminology had no clearer of a mental picture of the symptoms of the injury compared to people with less exposure.

We posited that the high familiarity for “concussion” (*Mdn* = 4) showed that people related to this term more than “mTBI” (*Mdn* = 1), and viewed mTBI as more obscure and frightening because they do not know what the injury is. Thus, we hypothesized that familiarity would influence responding on other perceptions of the injury (i.e., recovery timeline of the injury, self-efficacy to control the symptoms and recovery of the injury, consequences of the injury, positive and negative changes in life perspective, and undesirability of the injury). The hypothesis was not supported, as the results demonstrated that there was no relationship between participants’ familiarity with the terminology and their injury perceptions. In other words, it did not matter how much exposure participants reported having to the terminology, as it did not influence their responding on the questionnaires. This finding again corroborates the lack of clear information that exists in the general public regarding mTBIs because more exposure to the terminology clearly did not change participants' knowledge of the injury compared to people who were not as familiar with the terminology.

There was a trend towards statistical significance with familiarity with the terminology influencing responding on the negative changes in life perspective variable (p = .08). Specifically, people with low familiarity with the terminology expected worse changes in life perspective compared to people with high familiarity with the terminology. This finding is similar to Heaton, Smith, Lehman, and Vogt's (1978) result that found that people naïve to brain injuries tend to over-predict negative psychological symptoms and cognitive deficits as measured by formal neuropsychological testing.

Similar to the familiarity with terminology and injury perception findings, there was no effect of terminology as it related to the hypothesis regarding injury perceptions, as measured by the recovery timeline, consequences, and control/cure subscales of Illness Perception Questionnaire-Revised (IPQ-R). There was also no effect of terminology on responding on the Undesirability of Injury measure, which was unexpected given that Sullivan et al. (2014) found that "mTBI" was considered less desirable than "concussion." There was no effect of terminology as it related to expected negative changes in life perspective, as measured by the negative subscale of the Changes in Outlook Questionnaire-Short Form (CIOQ-S). It was noted that the mean and median scores for these injury perceptions were essentially the same for the "mTBI" and "concussion" conditions. These data suggest that people are viewing these two injuries as fairly equivalent on these dimensions, despite the fact that people are not as familiar with one of them (mTBI). This is consistent with medical professions and the research literature, which uses the terms interchangeably to refer to the same injury (Bigler, 2008). It is also possible that the different terms may have quite a different impact depending on the person; thus, people's varied expectations with the different terminology may not have been captured by the current methodology as it related to these injury perceptions.

Despite the lack of statistical differences, the mean scores on the personal control subscale of the IPQ-R were unexpectedly the lowest for the control condition. This low score, which reflects perceptions of low self-efficacy to control the symptoms and recovery of the injury, may be related to the ambiguity of the “no diagnosis” control condition. Participants may have wondered whether the person’s injury depicted in the vignette was more serious than it was intended to be; hence, they endorsed low self-efficacy because they could not anticipate the severity of the symptoms, and what it would take to control them, in the following 2 weeks. This information is important, as the data demonstrates that not receiving any information about an mTBI has a negative impact on people. This finding highlights the importance of medical professionals accurately informing people about mTBIs in order to manage symptoms and recovery.

Perhaps the most interesting finding of the study demonstrated support contrary to one of the hypotheses regarding expected positive changes in life perspective, as measured by the positive subscale of the CIOQ-S. The results showed that participants expected the term “mTBI,” relative to no diagnosis, to be associated with more positive changes in life perspective such as becoming more tolerant and understanding people, not taking their lives for granted, and valuing their relationships more. Although not statistically different from the control condition, the term “concussion” had the same median score as “mTBI” on this subscale. Again, these data show that participants viewed “concussion” and “mTBI” as fairly equivalent as it relates to positive changes in life perspective. This was a notable finding since this was the first study examining positive expectations related to mTBI.

This result may be related to research showing that experiencing a negative life event can cause people to positively grow in their psychological and personal development (Linley, 2003; Linley & Joseph, 2004). The general public may believe that sustaining an mTBI is a life-impacting event that causes them to gain a wiser outlook and life perspective. Why did participants expect positive changes in life perspective, but did not expect negative changes in life perspective? Perhaps it is related to people having a perception of mTBIs as injuries that can be overcome, people will be okay in the end, and will be better, stronger people for having experienced it. However, this result also shows that people may be naïve to the difficulties related to mTBIs such as occupational and relationship problems. These results may reflect the general public's lack of understanding of the realities of the injury, similar to Weber and Edwards' (2010) suggestion that people are "overly optimistic" about mTBIs (p. 1370).

These results were unexpected, and speak to the lack of clarity surrounding mTBIs that exists in the general public. This general lack of clarity was also found in previous studies (McKinley et al., 2011; DeMatteo et al., 2010), and is likely due to a combination of factors including the fact that the injury has gained societal attention only relatively recently, and no gold standard exists for terminology and diagnostic criteria. Given the ominous sounding nature – or "alarming" as DeMatteo et al. referred to it – of the term "mild traumatic brain injury" one would expect that people would associate worse symptoms and longer recovery with this term, despite the fact that it is synonymous with the term "concussion." These results, in combination with the results of previous studies, show that people generally do not know what to expect in terms of mTBI symptoms and recovery, but this can be altered by information. Other medical diagnoses such as cancer or a broken leg tend to evoke clear mental representations and specific expectations, yet this is not the case for mTBIs. The lack of clear expectations emphasizes the importance of immediately providing thorough and accurate information to people who have sustained an mTBI. As expectations at the time of injury are one of the best predictors of actual long-term post-concussive symptoms (Whittaker et al., 2007), a person needs appropriate resources, so expectations – and thus, actual symptoms – are managed upfront. For instance, it would be beneficial if a qualified professional such as a clinical neuropsychologist acted as a “life coach” by providing symptom-management and recovery advice throughout the 3 month recovery following an mTBI.

There were several limitations of this study. As noted previously, the lack of diagnosis in the control group may have caused ambiguity for the study participants and may have skewed the results. Similarly, responses on the Manipulation Check made it apparent that some participants in the control group (n = 5) responded to the questionnaires as though the character in the vignette sustained a concussion. The final question in the Manipulation Check asked participants to relay the diagnosis in the vignette without looking at it. It appears that some participants in the control group guessed that the character sustained a concussion in the vignette and approached the subsequent questionnaires with this injury conceptualization in mind. The participants who responded to this final Manipulation Check question with a diagnosis that did not match the condition they were in were excluded from the sample; however, it begs the question whether other control group participants guessed that the character sustained a concussion and approached the questionnaires in this regard.

It may be relevant for future studies to investigate the effect of the terminology on expectations for people who work in medical settings or have a history, and firsthand experience, with mTBIs. Further, it would be worthwhile to replicate the current study using a different diagnostic phrase for the control condition. Only changing the terminology in this study’s vignette allowed for methodological control; however, adding to the diagnostic phrase in the vignette to convey the information that the character's symptoms resolved and the character was discharged without a diagnosis may mitigate the ambiguity that the control participants experienced in this study. As noted previously, a different methodological design may better capture people's views of mTBIs. For example, perhaps asking participants to imagine the contents of the vignette may elicit a stronger emotional response, and subsequently different expectations, as previous research has demonstrated that imagining verbal content evokes a different emotional outcome compared to a non-imagery process (Holmes, Lang, & Shah, 2009). A video depiction of the vignette could similarly elicit different emotional responses and expectations. Finally, it would be interesting to evaluate how mTBI terminology influences expectations compared to a medical diagnosis that evokes a clear mental representation such as a broken leg or bruises and contusions. No previous researchers have investigated how people view mTBIs compared to other injuries that will have short-term consequences, but from which they will fully recover.

The results of this study, in combination with previous studies, highlight the fact that clarification of injury terminology is warranted, as it is clear that there is a significant lack of clarity surrounding brain injury terminology. There is currently no gold standard for mTBI terminology, as inconsistent language is used between the media and medical professions. The diagnostic criteria for the injury must also be standardized in order to create clarity. It is possible that the media's and general public's lack of clarity about mTBIs reflect the medical professions inconsistency with identifying related symptoms and diagnosing the injury (DeMatteo et al., 2010). This can also be seen in the present study's data that shows participants rated both "concussion" and "mTBI" as fairly equivalent on several dimensions, similar to the medical profession viewing these injuries as interchangeable. Both terminology and diagnostic criteria must first be clarified in the healthcare professions in order to disperse accurate information to the general public. Although terminology is only one factor that can contribute to mTBI symptoms and recovery, it is a factor that is relatively easy to control by medical professionals and should be considered carefully.

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Appendix A

Neuropsychological Lab Screening Form

INSTRUCTIONS*: If you are interested in being considered for studies in the neuropsychological lab, please complete the following screening questionnaire by filling in the blanks or circling your answers.*

Date ____________ Age ____ Gender _________ Ethnicity ___________________ GPA____

1. Were there any known difficulties with your birth? Yes No

   If YES, describe: ____

2. Do you have a vision problem that requires corrective lens wear (e.g., glasses)? Yes No

Education

3. Did you ever have to repeat any grades? Yes No
4. Were you ever placed in special education classes? Yes No
5. Are you currently receiving services from Disability Services for Students (DSS)? Yes No

   If YES, please indicate the reason you are receiving services: _________________________

   ____

6. What is the highest grade you have <u>completed</u>? (Please report years **completed**. For example, if you are a freshman in your 13th year of school, but you have completed 12 years of education. So, you would indicate 12.) ____

Medical and Health History

7. Have you ever been diagnosed with any neurological condition? Yes No

   If YES, please list: ____

8. Have you ever had a blow to your head that caused you to become unconscious for longer than 30 minutes? Yes No
9. Are you currently experiencing significant problems with your mood (such as anxiety and/or depression) or any other psychiatric condition? Yes No

   If YES, please list: ____

10. Are you currently receiving treatment for your mood (such as anxiety or depression or any other psychiatric condition? Yes No

11. Have you ever felt you should cut down on your drinking/drug use? Yes No

12. Have you ever been annoyed by people who criticize your drinking/drug use? Yes No

13. Have you ever felt bad or guilty about your drinking or drug use? Yes No

14. Have you ever had a drink first thing in the morning to steady your nerves or to get rid of a hangover? Yes No

15. Do you often drive under the influence of alcohol or drugs? Yes No

Head Injury History

16. Have you ever experienced a concussion or brain injury? Yes No

17. Were you knocked unconscious? Yes No

If YES, how long were you unconscious? (circle one)

1. Less than 1 minute
2. 1-30 minutes
3. More than 30 minutes

18. Do you remember the events before or after your head injury? Yes No

If NO, how long of a time period were you unable to remember?

1. A few seconds
2. Less than 5 minutes
3. Less than 30 minutes
4. 30 to 60 minutes
5. More than 60 minutes

19. Do you/have you ever play(ed) sports? Yes No

If YES, in what sport(s) do you/have you participate(d)?___________________________

____

Appendix B

Motor Vehicle Accident Vignette (mTBI, Concussion)

Car accidents are a fact of life and can happen to anyone. We are interested in your opinion of how such an accident might affect your ability to do everyday things. We would like you to imagine that you were driving about two weeks ago. When you were stopped at the traffic lights, another car hit your car. You hit your head on the steering wheel. You lost consciousness for about three minutes. You awoke spontaneously; without being woken by others. Within 30 minutes, you were able to speak and follow conversations normally. For example, you were able to tell others your name, the date, and where you were. On the other hand, you found it difficult to recall the accident and the events that occurred immediately after it. You also felt “dazed” so you were taken to hospital and stayed overnight for observation. You had a clear memory of the events that occurred at the hospital later that day.

Based on your injury, you were given a diagnosis of concussion [mild traumatic brain injury].

Try to answer the following questions as you think you might answer the questions after an accident like this. If you aren’t sure how to answer, guess.

Motor Vehicle Accident Vignette (No Diagnosis)

Car accidents are a fact of life and can happen to anyone. We are interested in your opinion of how such an accident might affect your ability to do everyday things. We would like you to imagine that you were driving about two weeks ago. When you were stopped at the traffic lights, another car hit your car. You hit your head on the steering wheel. You lost consciousness for about three minutes. You awoke spontaneously; without being woken by others. Within 30 minutes, you were able to speak and follow conversations normally. For example, you were able to tell others your name, the date, and where you were. On the other hand, you found it difficult to recall the accident and the events that occurred immediately after it. You also felt “dazed” so you were taken to hospital and stayed overnight for observation. You had a clear memory of the events that occurred at the hospital later that day.

Based on your injury, you were not given any diagnosis.

Try to answer the following questions as you think you might answer the questions after an accident like this. If you aren’t sure how to answer, guess.

Appendix C

NSI

Based on the vignette you just read, please rate the following symptoms with regard to how much you think they will disturb you in the TWO WEEKS following the injury.

0 = None – Rarely if ever present; not a problem at all
1 = Mild – Occasionally present, but it does not disrupt my activities; I can usually continue what I'm doing; doesn't really concern me
2 = Moderate – Often present; occasionally disrupts my activities; I can usually continue what I'm doing with some effort; I fell somewhat concerned
3 = Severe – Frequently present and disrupts activities; I can do things that are fairly simple or take little effort; I feel I need help
4 = Very Severe – Almost always present and I have been unable to perform at work, school or home due to this problem; I probably cannot function without help

Symptoms	**0**	**1**	**2**	**3**	**4**
Feeling dizzy					
Loss of Balance					
Poor coordination, clumsy					
Headaches					
Nausea					
Vision problems, blurring, trouble seeing					
Sensitivity to light					
Hearing difficulties					
Sensitivity to noise					
Numbness or tingling on parts of my body					
Change in taste and/or smell					
Loss of appetite or increase appetite					
Poor concentration, can't pay attention, easily distracted					
Forgetfulness, can't remember things					
Difficulty making decisions					
Slowed thinking, difficulty getting organized, can't finish things					
Fatigue, loss of energy, getting tired easily					
Difficulty falling or staying asleep					
Feeling anxious or tense					
Feeling depressed or sad					
Irritability, easily annoyed					
Poor frustration tolerance, feeling easily overwhelmed by things					

Appendix D

IPQ-R

We are interested in your own personal views of how you see the injury you sustained in the vignette.

Please indicate how much you agree or disagree with the following statements about the injury by ticking the appropriate box.

	Views About Your Injury	**Strongly Disagree**	**Disagree**	**Neither Agree Nor Disagree**	**Agree**	**Strongly Agree**
IP1	I expect that my injury will last a short time					
IP2	I expect that my injury is likely to be permanent rather than temporary					
IP3	I expect that my injury will last a long time					
IP4	I expect that this injury will pass quickly					
IP5	I expect to have this injury for the rest of my life					
IP6	I expect that my injury will be a serious condition					
IP7	I expect that my injury will have major consequences on my life					
IP8	I expect that my injury will not have much effect on my life					
IP9	I expect that my injury will strongly affect the way others see me					
IP10	I expect that my injury will have serious financial consequences					
IP11	I expect that my injury will cause difficulties for those who are close to me					
IP12	I expect that there is a lot which I can do to control my symptoms					
IP13	I expect that what I do can determine whether my injury gets better or worse					
IP14	I expect that the course of my injury depends on me					
IP15	I expect that nothing I do will affect my injury					
IP16	I expect that I have the power to influence my injury					
IP17	I expect that my actions will have no effect on the outcome of my injury					

IP18	I expect that my injury will improve in time					

Appendix E

CiOQ

Based on the vignette you just read, think about how you would feel about your life within the TWO WEEKS after the injury. Please read each of the following statements and rate how you think you will change as a result of the injury.

1 = Strongly Disagree
2 = Disagree
3 = Slightly Disagree
4 = Slightly Agree
5 = Agree
6 = Strongly Agree

Item	**1**	**2**	**3**	**4**	**5**	**6**
I don’t look forward to the future anymore						
My life has no meaning anymore						
I don’t take life for granted anymore						
I value my relationships much more now						
I’m a more understanding and tolerant person now						
I no longer take people or things for granted						
I have very little trust in other people now						
I feel very much as if I’m in limbo						
I have very little trust in myself now						
I value other people more now						

Appendix F

UI

How undesirable would you find such an injury?

1	2	3	4	5
Not at all undesirable				Extremely undesirable

Appendix G

FT

1. How familiar are you with the term “concussion” [mild traumatic brain injury] used in the vignette?

1	2	3	4	5
Not at all familiar				Extremely familiar

2. If familiar, where have heard this term before? (Check all that apply).

___ Personal injury history
___ People I know (e.g., friends, family, coworkers, etc.)
___ Media (e.g., the news, television, the Internet, etc.)
___ School/Work related activities
___ Other. Please explain: ____

Appendix H

MC

Please answer the questions below. Your responses <u>will not affect the amount of credit you receive for participation</u>. Your honest responses are important!

1. Did you understand the instructions provided in this study?

Yes ___ No ___

2. Did you forget to put yourself in the position of the character described in the accident while answering any of the symptom items?

Yes ___ No ___

3. In the story, for how long did you lose consciousness?
   ____

4. In the story, how long did you stay in the hospital?
   ____

5. In the story, what was your memory recall like after the accident?
   ____

6. Circle the number that best describes how hard you tried to follow the instructions you were given:

1 2 3 4 5 6 7 8 9 10
Didn't try at all Tried moderately hard Tried very hard

7. Circle the number that best describes how successful you think you were in producing the results asked of you in the instructions:

1 2 3 4 5 6 7 8 9 10
Not at all successful Moderately successful Very successful

8. Without looking at the vignette, what was your diagnosis in the vignette?
   ____