THE USE OF EMOTIONAL METAPHORS AS AN INDEX FOR RECOVERY AMONG INDIVIDUALS WITH ACQUIRED BRAIN INJURY

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By ALEXANDER THEODOROU, B.A. (Hons.)

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AUTHOR: Alexander Theodorou, B.A. (Hons.) (York University)

SUPERVISOR: Dr. Magda Stroinska

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Lay Abstract

Metaphors represent one important method to interpret the world around us. Humans rely on metaphorical language to capture the essence of our experiences in meaningful and relatable ways. This is particularly true of those who have experienced a traumatic event, such as an acquired brain injury (ABI). Conveying feelings associated with trauma can often be challenging for individuals since the way they interact and perceive the world changes as a result. The shifting perspective is often described using metaphor to organize thoughts and give meaning to trauma. The current study examines the role of metaphor as a tool to uncover emotion following ABI and explore the implications it has in understanding psychological growth following the event. By exploring how abstract and emotional metaphors were, our results revealed that participants in the study had more positive elements in their metaphor use when describing their life over time and imagining the future.

Abstract

This paper examines the expression of emotion in narrative speech among individuals with acquired brain injury (ABI). We are particularly interested in the effects of ABI on the use of metaphor (c.f. Stroinska et al., 2014). Conceptualizing traumatic events and sharing them with others is crucial for prognostic purposes and reflected in the speech patterns of those who experience some level of post-traumatic growth (PTG). Emotion and metaphor constitute a relatively unexplored domain within the ABI community and merit further research given the prevalence of emotional disturbances following a brain injury.

This study explores emotional valence (i.e. the 'pleasantness' of the emotions invoked) and concreteness (i.e. how perceptible the referent of the word is) in metaphorical constructions. Emotional norm data was analysed using a corpus of approximately 14,000 commonly used English words ranking valence and arousal (Warriner et al., 2013; Kuperman et al., 2014). Thirteen semi-structured interviews with ABI survivors were conducted at a rehabilitation facility eliciting narrative recall of traumatic events and their experience across three temporal representations, namely past, present, and future. Results highlight importance of demographic information in recovery outcomes, which in our study accounts for 32% of the variance in emotion. Measures of valence revealed significantly increased use of positive metaphor over time, while the analysis of concreteness indicated events further in time represented more abstractly. Together, the findings shed some new light on emotional outcomes following ABI and indicate possible uses that figurative language may provide in understanding PTG.

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Last, but not least, I would like to thank my family for being a source of inspiration throughout this degree. I am especially grateful to have parents who have sacrificed so much to give me the much needed push and support in achieving my dreams. The emphasis of this thesis in acquired brain injuries is one I hold closely, as the impact of this devastating condition has affected my family and me personally. My hope is to shed some light in the domain of trauma research and brain injuries and to offer a glimpse into understanding and giving meaning to the world for those who suffer.

List of Abbreviations

ABI Acquired Brain Injury

CMT Conceptual Metaphor Theory

DSM Diagnostics and Statistical Manual of Mental Disorders

PTG Post-traumatic growth

TBI Traumatic Brain Injury

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1.0 Introduction and Literature Review

1.1 The present study

An assessment of the literature surrounding acquired brain injury (ABI) reveals that patients demonstrate a deficit of emotional and conceptual understanding at the level of metaphorical processing. Various models have identified the role of metaphor from neurological (Citron & Goldberg, 2014; Schmidt & Seger, 2009), cognitive (Lakoff & Johnson, 2003; Semino, 2010; Stewart, 2014), and linguistic (Jaeger, Lindblom, Parker-Guilbert, & Zoellner, 2014; Marini et al., 2011; Rosenbaum, 2006) perspectives. Other studies view these topics more conceptually, based on the premises of conceptual metaphor theory (CMT) data (Lakoff, 1992). A complete presentation of the connection between emotion and conceptual metaphor requires both quantitative and qualitative analysis in order to provide a powerful instrument to assess these concepts in action (Kövecses, 2014). The use of metaphor can provide a wealth of information and vivid details towards understanding of human experiences. An examination of real data allows the researcher to gain an insight into the mental representation of emotions in literary mediums, such as narrative discourse. People tell stories and through this narrative action construct their lives by giving meaning to the past and by formulating aspirations for the future (Amir, Stafford, Freshman, & Foa, 1998; Angus & Kagan, 2013; Morris, 2004) This particular form of discourse is evident in the aftermath of trauma when survivors attempt to identify and later synthesize their experiences, noting the recallable aspects over time. The produced narrative outlines their life along a spectrum of progression as indicated, from past, through present, towards the future. Despite experiencing profound

distress, some individuals can experience positive psychological change manifested in ways which include self-disclosure of emotions, change in life's narrative, and increased personal strength (Tedeschi & Calhoun, 2004).

Current best practices revolve around standardized assessments of PTG and recovery requiring formal questionnaire methods. To date, few multidisciplinary approaches have been adopted in addressing figurative language use among ABI survivors, in particular methods originating from purely conceptual, clinical, or linguistic approaches. The use of figurative language by persons with ABI may provide sensory, perceptual (Lakoff, 1992), as well as affective information (Kövecses, 2000a) that could be studied with discourse analysis methods. Emotion studied through metaphor and emotional alterations in figurative speech post-injury yield a promising avenue of exploration, yet many gaps still exist along this line of research. Only recently has metaphor research been introduced to traditional measures of recovery and growth which serves a variety of purposes, including assessing emotional outcomes (Boylstein, Rittman, & Hinojosa, 2007; Costa & Steen, 2014; Stewart, 2014). An alternative question that requires attention is to determine the emotional meaning, or level of abstraction that metaphors could provide to the study of narrative. To date, no research offers an answer to this question, with this paper set out to critically examine the role of emotion and abstraction within the pervasive effects of trauma.

The approach taken in this study is somewhat bottom-up as it examines the overall emotional charge conveyed through metaphor according to a thorough investigation of the emotional valence of words which comprise it. In light of the abstract nature of human

emotions, corpus data offers quantifiable measures of emotion along two validated dimensions: valence, and arousal (Warriner, Kuperman, & Brysbaert, 2013). Due to the prevalence of variable levels of positivity observed in the narrative language of ABI survivors, emotion, as defined by valence, will be explored in depth. Arousal, on the other hand, was generally shown to not cause marked changes (Bornhofen & Mcdonald, 2008).

The present study attempts to explore two dimensions, the emotional valence and concreteness in metaphorical constructions to see if they could serve as a possible index of post traumatic growth in ABI that would be compatible with current models. A cognitive linguistic approach was used in assessing metaphors according to CMT in order to group clusters of metaphorical constructions into thematic patterns characteristic of recovery, specifically the source-path-goal schema[1]. The metaphorical data itself was further analysed into its compositional elements, segmenting metaphors into individual words, which were then mapped onto the emotional and concreteness corpus values obtained from Brysbaert, Warriner, & Kuperman (2014) and Warriner, Kuperman, & Brysbaert (2013). The data was further examined alongside demographic information collected from the participants, consisting of age, time post injury, highest level of completed education, and current DSM clinical diagnosis for each individual. In line with conceptual metaphor and cognitive linguistics frameworks, emotional valence is expected to provide insight into the depths of trauma experienced and the subsequent recovery

[1] Source-path-goal represents a complex component of the spatial patterns of motion in the image schemas of primary metaphors (e.g. LIFE IS A JOURNEY). In the framework of trauma, the source represents the start point of the journey while the path and goal represent the ongoing process towards recovery (Costa & Steen, 2014).

process. It is our hope that the work presented in this thesis will inform related research in the domain of emotional processing and trauma. The results will inform trauma research about the role and possible prognostic value that metaphorical language may offer during the recovery process. The goal of this work is to achieve a better understanding of the experience of traumatic events such as an acquired brain injury (ABI) through the analysis of emotion and concreteness within narrative.

1.2 Literature Review

The following literature review sections are arranged to address the abovementioned topics. First, an overview of narrative theory and trauma research identifies the most important contribution in these areas that are relevant to the issues discussed in this thesis (section 1.2.1). Then, the significance of metaphor as a communicative tool is explored within trauma research and, in particular, acquired brain injury studies, with supporting data drawn from both prominent linguistic and cognitive theories of metaphor, symbolic thinking, and clinical research (section 1.2.2). Thirdly, representations of time and time perception in metaphor are explored among ABI research which assess cognitive and neural rationale to account for deviations uncovered in the data (section 1.2.3). Fourthly, conceptual and neural bases of emotion in the framework of metaphorical constructions among ABI survivors are examined within small and large scale samples with emphasis placed on the need for data-driven approaches (section 1.2.4). Lastly, standard and non-standard approaches to recovery

models following ABI are explored. Corresponding demographic and cognitive variables are recognized and assessed for their relative impact on developing an understanding of the possibility of post traumatic growth following ABI (section 1.2.5).

1.2.1. Trauma and narrative: an overview

The nature and extent of trauma may take a variety of forms, affecting the way survivors perceive the world around them. The distorting effect of traumatic experience manifests in the ways the trauma survivors capture, construct, and produce the altered representation of their life. In psychological terms, trauma is defined as an individual's response to an event or series of events which completely overwhelm one's ability to cope with the experience, and integrate it into life's narrative (American Psychiatric Association, 2013). At a cognitive level, traumatic memories are dominated by sensory, perceptual, and emotional details. Consequently, any attempt at representing this event impacts the memory system by impeding encoding, consolidation, and recall within our autobiographical memory, such as the memories related to personal life experiences (Crespo & Fernández-Lansac, 2016). One view opposite to this suggests that impediments to memory may not be as significant as it was initially thought (Baird & Samson, 2014; Knight & O'Hagan, 2009).

Despite the fact that traumatic events commonly generate negative associated mindsets, they can also become connected with some level of positivity through identity rebuilding, and potential personal growth. The use of narrative approach helps individuals re-construct their life through the use of language as a means to build and understand a

new view of the self. This approach is based on the notion that one's self is narratively constructed in order to rebuild identity according to changes experienced by people afflicted by trauma (Morris, 2004). As traumatic conditions cannot (and should not) be recreated, survivors' narrative is the main option to access the content of their memories (Crespo & Fernández-Lansac, 2016). At the outset of narrative analysis, psychotherapeutic techniques are used to help the survivor externalize the internal world by organizing psychological activity into different narrative constructions (Panhofer, Payne, Parke, & Meekums, 2012). Subsequently, traditional approaches that have their roots in neuropsychological techniques provide clinicians with a set of criteria necessary to define a set of symptoms leading to a diagnosis (American Psychiatric Association, 2013). This is reflected in the framework outlined within the Diagnostic and Statistical Manual for Mental Disorders (DSM-V). The diagnostic criteria are constantly under revision to reflect the collective evolution of our understanding of each disorder as more information is unfolded through clinical observations. However, diagnostic process generally focuses strictly on a fixed set of questions with performance relative to normative populations, de-emphasizing the importance of personal context.

Narrative provides an understanding of trauma related details and is able to encapsulate past experiences by the process of reconstructing one's life. The narrative illustrates the importance of establishing an identity (the self), even though it is always dynamically changing. Research by Fraas & Calvert (2009) adopted this approach associating four adaptive themes emerging from the narrative, namely development of support networks, grief and coping strategies, acceptance of the injury and redefinition of

self, and empowerment. The themes represent adaptive features which were identified as necessary for rehabilitation in reconstructing a satisfying sense of self. This approach can help in understanding the overarching themes which characterize the perceptions of life and recovery of a trauma survivor.

Determining language-level features of the survivors' discourse may provide a reliable index of cognitive processes observed in the aftermath of trauma. One particular explanation includes the importance of the content and structure of trauma narratives and its association with other persistent trauma-related types of psychopathology (Jaeger, Lindblom, Parker-Guilbert, & Zoellner, 2014). An examination of content allows for elements such as emotional words to be further subdivided into positive (e.g. enjoy, happy, good), and negative (e.g. hate, worthless, enemy) words. The analysis of the possible indicators explored within narrative discourse extends to grammatical functions, which include pronoun use (Jaeger et al., 2014), the usage of deixis (Rosenbaum, 2006), as well as an organization of the semantic content (Marini et al., 2011). Together, these aspects of the linguistic representation of content provide one side in the analysis of trauma narratives that aims to address the perceptions held by the survivors in their recollection of events.

The structure of the post-trauma narrative involves additional integral knowledge directed at understanding discourse in specific contexts. This has been demonstrated by observing discourse cohesion, as well as fragmentation in the narrative offering a possible window into the complexity of the experience of trauma. Measures of cohesion relate the overall connectedness of speech with dysfluencies exerting a fragmenting effect that

reduces the overall coherence within conversational discourse (Crespo & Fernández-Lansac, 2016). As a result, speech is characterized as less informative, vague and somewhat ambiguous, impacting communicative effect but still preserving normal lexical and grammatical skills (Marini, Zettin, & Galetto, 2014). The linguistic disorganization and fragmentation suggest a deficit at the interface between cognitive and linguistic mechanisms, and not purely a disturbance of language (Marini et al., 2014). Structural results account for the modified representations of memory linked to post traumatic symptoms and trauma outcome (Dekel & Bonanno, 2013). While both macro-linguistic (structure) and micro-linguistic (content) factors have been observed in trauma narratives, the degree to which individual experiences of trauma are understood remains unclear. The current body of trauma narrative research points to the potential relevance of figurative language, which mediates experiences that go beyond solely linguistic content in discourse. Trauma-specific memory models connect narrative themes grounded in great sensory detail (Welton-Mitchell, Mcintosh, & Deprince, 2013), with this study supporting the idea that giving meaning to a memory using metaphorical language could serve as a vehicle to convey some difficult experiences.

1.2.2 The role of metaphor in acquired brain injury

Metaphors were traditionally considered to be literary devices used mostly outside the everyday conversations. A metaphor involves the mechanism of assigning to an object (tenor) the name that belongs to another object (vehicle) in order to transfer some features of the vehicle to the tenor. Usually tenor is something more abstract, complex and

unfamiliar while vehicle is something simple, familiar and more concrete. In Lakoff's words, "*metaphor* was defined as a novel or poetic linguistic expression where one or more words for a concept are used outside of its normal conventional meaning to express a *similar* concept" (Lakoff, 1993, p. 1) This makes metaphor a great tool in describing what is difficult to comprehend (e.g. complex phenomena) or difficult to talk about (e.g. emotions) in terms that make these concepts easier to understand. Only relatively recently has metaphor theory been refocused to see metaphor as a cognitive tool of "cross-domain mapping" that frames human perception. This form of mapping connects concepts such as time, states, causation, and change to each other (Lakoff, 1993). The Conceptual Metaphor Theory (CMT) (Lakoff & Johnson 1980) states that the way we talk about everyday abstract concepts such as time, causation or purpose is metaphorical, with cross-domain mapping being absolutely central to natural language processes (Lakoff, 1993).

Metaphors are a unique tool for communication, connecting concepts or mental representations to objects or actions. To say "*I had fallen into depression"* is an example of two conceptual metaphors, one that represents EMOTIONS AS PHYSICAL SPACES[2] and one that represents feeling SAD AS DOWN. It is also a communicative device that allows the speaker to capture in a non-literal way the manner, intensity, and relationship between items involved in the metaphor. When analyzing the elements composing this metaphor, the object which we ascribe qualities to (the tenor) is the feeling. The object or concept to which we compare the tenor (vehicle) is the physical movement down (*falling*)

[2] By convention, conceptual metaphors are indicated as upper case to denote metaphorical use according to conceptual metaphor theory.

and into a low space (literally a depression). Restating the above metaphorical example, the vehicle would represent the pervasive sadness characteristic of depressive symptoms through the verbal act of falling down. In order to account for the interaction between concepts or ideas within a metaphor, analogous cognitive linguistic accounts describe similar patterns of labelling metaphorical components using source (i.e. vehicle) and target (i.e. tenor) domains to inform us about the way a domain is conceptualized (Kövecses, 2000b; Liu & Zhao, 2013). It follows that the mapping of concepts from the source domain, recruiting concrete experiences, provides a means to think and talk metaphorically about another, more abstract or complex conceptual domain. Alternatively, we could say that the target domain, comprised of abstract experiences, may be metaphorically thought of and talked about in terms of another conceptual domain (Lakoff & Johnson, 2003; Semino, 2008; Lakoff & Johnson, 1980). These principles guide the Conceptual Metaphor Theory approach in mapping the rich mental representations associated with cognitive processing and related phenomena onto more concrete domains of the perceptible physical world.

Conceptual Metaphor Theory (CMT) describes abstract concepts through the use of analogy to form concrete, embodied experiences (Pecher, Boot, & Van Dantzig, 2011). It was first proposed in Lakoff and Johnson's 1980 book, *Metaphors We Live By,* framing our conceptual system (i.e. the way in which we attribute meaning to things) and our everyday experiences as fundamentally metaphorical in nature. Their understanding of metaphoricity examines the transfer of meaning from the relatively concrete vehicle/source domain to the relatively abstract tenor/target domain. According to the

CMT, the basic concepts central to human experience can be classified as image schemas. Image schemas give spatial-temporal, and sensory-motor experiences a structure when applied over various sensory modalities. In doing so, the metaphors are grounded in symbolic representations and related to embodied experiences (Pecher et al., 2011). An embodied metaphor shapes our understanding in the process of meaning making by providing stable links relating sensory and perceptual experiences (Lakoff & Johnson, 2003). Embodied effects are those where sensation influences conceptual processing but conceptual processing does not influence sensation. The asymmetry directly connects experiences in the world and maps their relationship using sensory or perceptual details. The patterns of bodily interactions and experiences are connected in metaphor and motivated by image schemas linking concepts in our conceptual system (Lakoff, 1987). One such example is found within CMT in the source-path-goal framework which illustrates spatial patterns of motion using a point of origin (source), an idealized trajectory, or motion (path) towards a destination (goal). The conceptual metaphor ACTION IS SELF-PROPELLED MOTION can be illustrated with many instances of expressions that follow the 'movement with respect to some goal' structure. There were many examples of those particular metaphors observed among ABI sufferers (Tay & Jordan, 2015). In the previous metaphorical example of *falling into depression*, the action of falling (i.e. source domain) is used to represent and highlight a reduction or change in affective experiences following some event, instantiated by the implied downward motion of falling. However, if we further deconstruct the verb at the level of intention, falling is often an event which happens unpredictably, without any willingness of the subject to do

so. Subsequently, the emotional state of depression (i.e. target domain) is likely assessed concretely as a low space. It is worth noting here that the medical term "depression" itself is a metaphorical concept as the literal meaning of depression is a something that is a result of pressing down.

Tay & Jordan (2015) describe trauma as a deviation from the conventional assumption of mapping between the target and source domain, suggesting that internal and external recruitment of experiential representations may shift. These internal and external experiences relate to the notion of "topic-triggered" or "situationally-triggered" metaphors, respectively, and is relevant for understanding the conceptual relationships used when speaking about trauma. Since trauma usually involves intense bodily experiences, according to CMT, these experiences are framed as concrete and thus embodied, and will likely not require additional external source domains. The trauma narrative allows the individual to discuss memories and feelings about an event in manageable ways which document the progression of their story and the recovery process. CMT models have also met with some criticism questioning the cognitive mechanisms underlying metaphor, whether metaphoric language truly implies metaphoric thought, and that CMT claims reduce embodiment in simplistic terms as to not practically represent the interactive, and dynamic system of the brain (Gibbs, 2009). Nevertheless, CMT has offered a new perspective for research into the nature of the connection between language and cognition, providing valuable insight into qualitative and quantitative discussions in cognitive science and mental health.

One particular CMT application is the study of the use of figurative language in the narratives of people with acquired brain injury (ABI). ABI represents a diagnostic category that includes traumatic brain injury (TBI), stroke, and brain tumours, consisting of both physical and cognitive impairments (Rosenberg, Simantov, & Patel, 2007). At a neuroanatomical level, pinpointing regions of the brain responsible for non-literal use of language remains controversial. Research from Rapp, Mutschler, & Erb (2012) reviews functional imaging measures obtained via functional magnetic resonance imaging (fMRI) investigating possible neural underpinnings of metaphor processing. A study using meta-analysis data examined across 38 fMRI studies in healthy participants isolated non-literal language processing, including metaphor, to predominately left-lateralised networks. Similarly, Yang, Fuller, Khodaparast, & Krawczyk (2010) examined TBI[3] patients exhibiting left hemisphere activity with differing degrees of activation in linguistic and non-linguistic neural regions. More specifically, observations in the left inferior frontal gyrus, an area specialized in semantic memory control and abstract thought, consistently displayed abnormal patterns of brain activation at the whole-brain level. Altogether, the brain areas were generally underactive for TBI patients compared to a healthy control group when processing metaphorical sentences. Less cognitive activity in metaphorical processing extended even when comparing literal language, novel, and conventional metaphors. Contrastively, other studies indicate the role of the right hemisphere involvement in processing metaphor (Bambini, Gentili, Ricciardi, Bertinetto, & Pietrini, 2011; Kasparian, 2013), but this may indicate compensatory effortful processing in a TBI

[3] Traumatic brain injury (TBI) represents an injury where an external force traumatically injures the brain.

patient group due to disrupted interconnectivity of processing abstract thoughts (Yang et al., 2010). However, subsequent findings from Schmidt & Seger (2009) support the notion that differences in neural correlates within metaphorical language processing might be attributed to familiarity (i.e. semantic relationship) with words in the metaphorical expression. An example of this would be in the form "*babies are angels"* where semantic relationships between the concepts of babies-angels could affect metaphorical processing and consequently perceived familiarity. In addition to this difficulty in metaphor interpretation, concepts that are semantically distant, with little overlap, result in greater processing difficulty. In this instance, forms such as "*political success is a house of cards*" are difficult and unfamiliar because they rely on recruiting additional right hemisphere cognitive resources in an attempt to give these metaphors meaning. Since familiarity entails a connection with semantic memory of past experiences, it may suggest that emotions are not fully dissociable from an analysis of this type.

At the cognitive level, CMT attempts to map embodied primary metaphors to the neural circuitry of the brain. Embodied primary metaphors are "motivated by tight correlations between distinguishable dimensions of recurring, locally defined experiences", and have bodily basis to them (Grady & Johnson, 2002). Further support comes from research on embodied primary metaphors and the connection to related experimental studies. Much like the human brain, metaphor mappings are many- to- many with the source and target structures in primary metaphors modeled in a similar manner to represent the detailed conceptual relationships (Lakoff, 2014). Supporting research has

shown that emotion metaphors possess directionality, with "up" generally associated with positive things, while bad things are conceptually "down" (Kövecses, 2000). A recent study by Sasaki, Yamada, & Miura (2016) extended the work of emotional data research to demonstrate that the space-valence relationship (positive is up; negative is down) persists by modulating voluntary action in identifying vertical position of a stimulus. With regards to positive associations, participants consistently associated a series of stimuli as vertically higher in comparison to the negative emotional associations which were perceived as lower. The results of emotion induced vertical positioning biases congruent with CMT image schemas suggest that their findings were likely mediated by sensorimotor representations. Further examination of relevant work on the emotional-conceptual experimental mappings reveals a lack of information at the level of metaphor, with even less research for traumatized populations such as those with ABI. Cognitive approaches may have important implications for both conceptualization of embodied understanding of metaphor in narrative, as well as complementary rehabilitation and therapy methods.

In order to deal with the repercussions of trauma, metaphoric expressions may be used to facilitate therapeutic reconceptualization of emotional pain (Stewart, 2014). A reframing of the traumatic experience away from metaphors which represent what hinders one's progress and towards a metaphorical journey that may lead to recovery helps to reconstruct a positive outlook conducive to healing. An example of such reframing is the concept of a journey which has the capability to produce metaphors that consider new paths (e.g. "*different roads to travel"*), and to view the goal of recovering and

reintegration to the community with optimism (e.g. *"a light at the end of the tunnel*) (Stewart, 2014). Describing complex emotions is usually difficult and often relies on the use of metaphor to best convey strong feelings. Emotions associated with trauma, as observed in ABI, are particularly difficult to capture. Working with ABI survivors is one example where the therapeutic effects of metaphor can be especially beneficial. Shinebourne & Smith (2010) suggest that patient generated metaphors provide a "safe bridge" to communicate emotions that are too distressing to communicate literally. In fact, metaphor has been shown to contribute in medical diagnosis by employing vivid imagery to describe features of injury and treatment. Related work that examined brain injury victims found that they use descriptive metaphors relating their trauma figuratively to events coming at them from outside (i.e. *"disaster", "struck by…"*) whereas recovery was described as a struggle (i.e. *"battle", "war"*) (Boylstein et al., 2007).

Therapeutic approaches assume that the way ABI survivors perceive reality can be linguistically constructed and that narrative could be an ideal platform to begin figuratively reconstructing life. Proponents of language-driven rehabilitation claim that metaphor analysis may be better suited for examining implicit values, meanings, and assumptions than are either quantitative or qualitative methods typically used in primary care research (Aita, McIlvain, Susman, & Crabtree, 2003). The role that metaphor plays in identity rebuilding is particularly evident throughout the recovery process, helping survivors to redefine their life while trying to make sense of, or give meaning to trauma (Morris, 2004). However, individuals with an ABI can experience shifting perspective of their life during the recovery process with self-identity, and traumatic memories (Dekel &

Bonanno, 2013) shown to change over time, along with metaphors used to describe the ABI experience (Boylstein, Rittman, & Hinojosa, 2007; Nochi, 1998). With trauma recovery representing a dynamically changing process, understanding the temporal progression of narrative aids in determining the ways in which individuals manage their mental representation of trauma over a span of time.

1.2.3 Temporal representations of trauma

Of particular interest within the metaphorical details observed in trauma narratives post-ABI is the chronological representation of time. Time stands as a measure to view the narrative unfolding in a sequential manner, yet the perception of it is particularly sensitive to some aspects of trauma. Linking events and experiences into a coherent sequence requires an understanding of their connection to past, present, and to the imagined future. Language affords the speaker the ability to mentally travel through time, which hinges on specific facets of memory. Among these are the qualities of what we know and details we remember, located in semantic and episodic memories, respectively (Corballis, 2009). This suggests that our ability to construct future events is extrapolated from fragments of past memories and from current experiences. This is possible due to the combinatorial structure of episodic memory (Corballis, 2009).

Temporal impairments are particularly evident following ABI because of the high incidence of trauma to the frontal lobe and cognitive dysfunctions that are associated with it. The regions of the frontal and temporal lobe contribute to the construction of memories of the events that have occurred throughout one's life. Thus memories are sensitive to

damage to these areas. Despite the impact trauma has on episodic memory (Rasmussen & Berntsen, 2014), time perception along ABI survivors remains relatively stable and is no longer impaired after a year of recovery for moderate-severe TBI (Anderson & Schmitter-Edgecombe, 2011). This finding was further validated by Coste et al. (2015) who examined the distinction between remembering and representing the past, as well as imagining the future in patients with severe TBI. The representations of oneself across time, known as the temporally extended self-memory system is in line with the subjective differences of severity of brain injury. This system probes self-representations across past, as well as current and future contexts. The abovementioned TBI data diverges from what Anderson & Schmitter-Edgecombe (2011) report in that it finds that a global impairment of temporal representation across the past and future diminishes any form of self-representation. Despite the fact that ABIs impact time perception at a neural and perceptual level, they diverge when examining injury severity. In Anderson and Schmitter-Edgecombe's study, the participants with greater severity of trauma and greater elapsed time since the onset of injury had more pronounced impairments of time perception and conceptual representation of experiences. The study of mental time travel within ABI community is sparse, with less documented research concerning how this domain interacts with metaphorical understanding.

The transfer of meaning across time may be represented metaphorically, as are other memories. CMT's representations of trauma view time as a medium that provides an opportunity to integrate or dissociate negative memories surrounding the experience of the traumatic event. Since metaphor represents simultaneous conceptual mapping of

experiences to meaning, trauma may block the conscious connection, linking, or association of two experiences resulting in dissociation (Stern, 2009). Since re-experiencing of negative emotions can occur when revisiting past events, traumatized individuals tend to sever the associated metaphorical links or avoid figurative language altogether during narrative recounts of traumatic experiences. Analogous observations from Stern (2012) view metaphor construction in trauma narratives as an impediment to awareness of self-states, the psychoanalytical equivalent of what is otherwise known as the temporally extended self-memory. It was shown that severe trauma can result in the dissociation of these states leading to a disconnection of the past and the present. The disconnection may be, in part, due to impaired awareness following ABI, where reduced self-awareness signifies a denial of difficulties experienced following an injury. Reported levels of emotional distress affected awareness (McBrinn et al., 2008), as well as the experience of time, with depressive symptoms shifting preoccupation towards past events, as opposed to present and future (Gallagher, 2012). There remains no clear consensus on the issue of temporality for the trauma sufferer, with data demonstrating various adjustments to temporally sensitive experiences reflecting the events that had passed, current state, and a predicted future outcome.

1.2.4 Studies on emotional processing and figurative language

An examination of figurative language thus far points to the possibility of the added value of emotion in an understanding of the impact of trauma, and more specifically ABIs. In accordance with CMT, they suggest that emotion-related concepts

are largely represented in terms of forceful entities[4] exerting an effect on other entities (Kövecses Z, 2000). In this instance, force is defined as metaphorical and enable speakers to use verbs to trigger a particular event structure when using metaphorical language. A case for the nature of force in the events depicted in metaphor can be observed in, "circumstances *drove* him to commit suicide". According to this view, events in general, including changes of states, actions and activities are understood in terms of physical movement, physical force, and physical space (Lakoff, 1992). Metaphorical forces may be cognitively examined through an event structure which creates an emotional landscape and timeline for actions represented by metaphors. Using metaphor provides a set of tools needed to capture a range of emotions and represent them in terms of interrelated concepts which can be intuitively connected through basic human experiences.

One such example is the primary metaphor of BARRIERS ARE IMPEDIMENTS TO MOTION, as illustrated in the expression *I got stuck writing this chapter*. Here, the process of writing is concretely outlined as some sort of movement which at some point encounters a physical barrier exerting a counter force or obstruction. This representation captures in figurative terms the stressful emotions that accompany the process of writing. Metaphorical conceptualization of emotions attempts to equate the intensity of the experience with the intensity of its metaphorical representations. The narrative intent is to convey the degree of expressivity (i.e. whether emotion is conceptualized as visible or internalized) which examines aspects of emotional experiences foregrounded by

[4] Entities, in this case, broadly refers to conceptual elements which comprise the metaphorical expression. In "Fear ruled over her", the entities connect the emotion of fear and the woman experiencing this emotion.

metaphor (Soriano, 2010, p. 209). As the focus shifts from various emotionally representative structures, so do the corresponding structures of metaphor. For example, emotions conceptualized as ILLNESS are represented as negative and harmful, and emotions conceptualized as FIRE are seen as intense.

Boylstein et al. (2007) report that trauma metaphors following an ABI view the RECOVERY AS A WAR, and position the individual as "fighter" throughout the process. This is similar to the conceptual metaphor DISEASE AS A WAR. Due to the links connecting associated vocabulary, such as "fighting", "struggling", and "battling", the semantically interconnected terms structure the experiences of recovery as an antagonistic relationship with the body. In this sense, the battle, or enemy is not the physical diagnosis of ABI itself, but rather the deficits experienced as a result of this. For those afflicted by an ABI, the emotional message of their recovery narrative is often best expressed through metaphor (Häggström, Axelsson, & Norberg, 1994; Morris, 2004).

Metaphors represent emotions embodied at the level of the individual experience, but these observations cannot be easily generalized to larger populations. A corpus-based methodology provides an enriched description of emotion concepts and offers the possibility of quantifying results through an explicit or implicit evaluation of the emotions. Emotional responses are classified according to subjective experiences and feelings elicited for a given word and obtained from a large sample of people (Oster, 2010). The evaluation posits emotion as an abstract construct perceived through our sensory organs and consisting of two major dimensions: valence and arousal. Emotional

valence represents pleasantness of the emotions invoked by a word, going from unhappy to happy, and arousal is defined as the intensity of emotion provoked by a stimulus. These dimensions help us to determine the level of positivity and negativity that is associated with the words that metaphors are built of (Soriano, 2010).

While many emotions remain idiosyncratic to a given individual, corpus methodologies have provided additional support for testing conceptual processing claims on a larger scale. Extending this approach to the affective dimensions of words within a corpus, Oster (2010) was able to find evidence that conceptual metaphor provides structures for emotion concepts. Oster examined common CMT event structure co-occurrence and frequency distribution. According to this method, positive, negative, and neutral emotions are evaluated lexically in accordance with attested CMT themes, such as "good is up", and "bad is down". To clarify this, identifying conceptualizations of positively oriented words within the data hinged on utilizing metonymic forms such as prepositions and directional terms (i.e. high, above…etc.). This type of pure corpus analysis may be problematic by limiting the identification of a metaphor's context. Also, the attitudinal information found through prosody is relatively inaccessible within pure corpus data (Oster, 2010; Steen, et al., 2010). Traditional measures include collocations, word frequency, and parts of speech to tag lexical items to indicate emotionality considered over large amounts of text documented over time. A possible way around the problems associated with corpus-based analysis of metaphorical expressions is to explore emotions themselves as embodied in each word, as demonstrated by Warriner, Kuperman, & Brysbaert (2013). Based on online data collection, they developed a corpus of nearly

14,000 common English lemmas ranked for valence, arousal, and dominance. It was shown that primary demographic information such as age, gender, and education may influence attitudes and opinions derived from the emotional features in a word, which, in turn, could improve accuracy of the estimates of pragmatic usage of emotional information.

Both CMT and corpus methodologies contribute meaningful information on underlying emotional processes. The former is well suited to address qualitative changes in emotion and underlying universals accounting for the affective experiences, while the latter offers measurable criteria for emotion assessment using extensive amounts of data. Independently, they allow for a deeper understanding of the framework and parameters which emotion entails; together, they provide research methods with a much richer source of information on human behaviour. The few existing attempts at bridging gaps between emotion, metaphor, and trauma in exploring the effects of ABI require more research aimed at uncovering how these areas are interrelated.

1.2.5 Recovery models following acquired brain injuries

Given the multidimensional nature of ABI injuries, a multimodal approach seems best fitted to aid affected individuals and to extend our knowledge of exactly what such recovery entails. Models of recovery identify alterations post-ABI that impact various areas of functioning. However, those models tend to emphasize cognitive deficits following such an event, with less focus on recoverable aspects of cognition. A focus on the areas that offer optimism, positive aspects of life, and adapting to change could be

associated with post traumatic growth (PTG). The concept of PTG is defined as a positive psychological change experienced as a result of the struggle with highly challenging life circumstances (Tedeschi & Calhoun, 2004). Here, we are specifically interested in how the representation of emotion in figurative speech in trauma narratives contributes to an understanding of trauma recovery and the possibility of PTG.

Research from Wild & Paivio (2003) examined factors such as the level of psychological functioning, coping, and emotion regulation associated with number and recency of traumatic events, and levels of distress. They found higher levels of distress at the time of traumatic event to uniquely predict PTG while emotional regulation failed to contribute to PTG. According to their work, more intense traumatic experiences produce greater benefits and likelihood for PTG. In contrast, and counter to their predictions, emotion regulation, a form of coping strategy to manage feelings associated with trauma, did not contribute to PTG. These findings show that growth may arise from intensely distressing traumatic events. However, it should be noted that in this study traumatic events were elicited from a heterogeneous group of participants who have experienced "actual or threatened death, serious injury, or threat to physical integrity of [themselves] or others", as well as "extreme fear, helplessness, or horror in response to traumatic event" (Wild & Paivio, 2003, p. 106). Contrasting the results of Wild and Paivio's study, data from ABI participants identified lower levels of distress (i.e. anxiety) and greater use of coping strategies (i.e. emotional support and positive reframing) correlated with greater levels of self-reported PTG. Only coping strategies appeared to be a statistically significant variable in predicting personal growth (Rogan, Fortune, & Prentice, 2013). A

closer inspection reveals the importance of demographic variables in assessing ABI growth outcomes. In addition to these studies, a meta-analysis of 744 published studies reviewed by Grace, Kinsella, Muldoon, & Fortune (2015) examining the relative influence of demographic variables, injury factors, subjective beliefs, and psychological health on the likelihood of PTG following ABI. Results indicated that higher levels of education, longer time since injury, older age, and subjective beliefs about change post injury best reflected positive and meaningful changes associated with PTG. In a similar vein, time post injury was identified as a significant moderator of PTG related relationships, shown to strengthen cognitive processing measures, such as positive cognitive restructuring and resolution (Gangstad, Norman, & Barton, 2009). The collective factors examined provide important implications for rehabilitation following traumatic injury and recovery, as a whole. The claim that PTG inventories accurately capture the often ongoing and non-linear levels of distress after brain injury is not confirmed, documenting only static views of growth. In this context, PTG analyses may be better served by narrative research attending to the dynamic patterns of growth across time reflected in the use of language.

Although benefits of PTG resulting from the experience of trauma have been documented (Gangstad et al., 2009; Helgeson, Reynolds, & Tomich, 2006; Rogan et al., 2013), PTG inventories are limited in identifying the range of emotional and overall recovery capacities for individuals. This challenge can be addressed in a new way from the perspective of CMT framework exploring a wider range of experiences and providing a basis for a comprehensive construction of post-ABI reconceptualization. An analysis of

trauma interviews highlights the potential role of metaphor in the analysis of how traumatized individuals talk and reason about their life during narrative recall. Costa & Steen (2014) assess PTG and recovery outlook using conceptual metaphorical patterns to construct a model of trauma representation. They developed a list of target keywords which recur throughout the data, identifying the image schemas of directionality of feelings (i.e. up/down), the body as container for emotions (i.e. out, inside), sight as understanding (i.e. outlook, see), and motion as action (i.e. path, forward, through) which they consider relevant to the experience of trauma and recovery. In their account, trauma is characterized by antagonist pressures expressing downward tendencies, no motion, no sight, and a closed container. The opposite is associated with healing processes where other target keywords were observed, such as more motion and upward tendencies. Together, the two opposing metaphorical representations which identify trauma and the process of recovery situate the image schemas used along the primary metaphor, LIFE IS A JOURNEY (i.e. the source-path-goal schema). We believe that while CMT and standardized PTG assessment approaches collectively target a better understanding of the state of trauma and the process of recovery, the compositional details and the way they interact with figurative language are of considerable importance. By finding a meaningful relationship between the set of demographic information and conceptual patterns emerging in the narratives of ABI survivors, we may be able to identify the moderating effect of the demographic data and its significance as indicators of the possibility of PTG.

2.0 Research Methods

The experimental part of the study consisted of interviews conducted with participants recruited by the researcher from among the clients of Brain Injury Services Hamilton (BISH), Ontario. A Research Ethics application outlining proposed research methods was filed with the McMaster Research Ethics Board and an approval for the study was granted in October 2015 (MREB #2015 169).

2.1 Participants

Thirteen individuals with acquired brain injury (11 males, 2 females), recruited from Brain Injury Services Hamilton, Ontario, took part in this study. Traumatic brain injury accounted for the majority of brain injuries (70%), with remaining injuries deriving from organic causes and predominately due to cerebrovascular accidents. Participants had all met the criteria for cognitive competency, having capacity to consent for themselves. They possessed adequate speech comprehension and production skills and had a significant amount of time elapsed post-injury (M=26 years, SD=14. 6). The demographic details are presented in Table 1. The group consisted of individuals with a range of underlying causes of brain injury deriving from both organic causes (i.e. cerebral infarct and hemorrhage) and external sources (i.e. physical trauma). Participants lacking capacity to consent or possessing congenital or developmental disorders were excluded from the study. Six participants were assessed as having met the Diagnostic and Statistical Manual of Mental Disorders (DSM-V) criteria for clinical disorders (*See Appendix A).* That diagnosis was made prior to admission into Brain Injury Services' rehabilitation facility which all of the participants attended. Study participation was completely voluntary.

	Mean	Standard Deviation (SD)	Range
Age	43	8.67	(26-57)
Formal Education (years)	12.15	2.34	(8-15)
Time Post Injury (years)	22.7	10.4	(6-39)

Table 1*: Participant Demographics*

2.2 Materials

As the goal of the proposed study was to obtain and analyze data on the use of figurative language and expression of emotions in narratives of people with traumatic brain injuries, the first task was to conduct interviews with the subjects. Twelve questions were carefully constructed to elicit narrative recall. The questions were designed to examine individuals' perspective of time prior to their injury, current, and future outlook going past the traumatic event. The interview questions were adapted from those found in Szymanski & Rosenfeld (2014) which address trauma and post-traumatic growth (PTG). Questions omitted any evocative wording which could prime or lead an individual toward any particular direction in their responses. This was ensured by preventing the use of any comparative words such as "being like", "as" or direct comparison (simile). This prohibited any explicit triggering of similes or metaphoric constructions. In addition to the trauma-specific questions, topics addressing introspection and theory of mind were included to generate some form of expression of the participants' perception of past experiences.

Interviews were conducted at the premises of the Brain Injury Services Hamilton (BISH). They lasted between 15 and 30 minutes, depending on how much the participants wanted to talk in response to the researcher's questions. A *Zoom H4N* recording device was used to capture audio data during the interview. Audio data was automatically transcribed using Dragon dictation software and manual transcription was used for those cases which were inaudible or unclear. The data was quantified using a corpus of 13, 915 common English words ranked along several dimensions, which include emotional valence (i.e. pleasant and unpleasant emotions invoked by a word) and arousal (i.e. exciting or calming emotions invoked by a word) (Warriner, Kuperman, & Brysbaert, 2013). The concreteness of a given word was considered by using a corpus of 40,000 words classified on a spectrum of how concrete or abstract they were perceived. This was largely determined by a participant's sensory experience with a given word according to visual and haptic experiences (Brysbaert, Warriner, & Kuperman, 2014).

2.3 Procedure

The study employed a semi-structured interview format. Participants were seated in a comfortable chair in a private room located at BISH. The interview begun with subjects filling out the required demographic and consent forms. All participants were evaluated by the clinical staff at BISH and deemed to have capacity to make informed decisions and engage in the study. Once the forms were read and completed, the interview commenced by proceeding through the questions to elicit reflections of experiences prior to the trauma event. The conversation utilized a client-led approach by allowing the individual to expand upon each question, intermittently requiring some redirection and

reframing towards the question from the researcher. The interview was semi-structured and allowed for some departures from the questions. It was the researcher's belief that doing so would provide a more objective and naturalistic approach to narrative recall. Questions which individuals did not feel comfortable responding were skipped and the researcher proceeded with the subsequent questions of the interview. Participants were reoriented to the question if their responses were becoming tangential. Questions which were not clearly understood were repeated or participants were invited to read them themselves for clarity. Participants were naïve to the study objectives and the researcher did not reveal that either emotion or their use of figurative language (i.e. metaphor and simile) were documented throughout the interview. Interviews lasted up to approximately 15-30 minutes per individual. Once the interview was completed, participants were debriefed, given a copy of the consent form, and thanked for their participation.

2.4 Data Analysis

2.4.1 Analysis of Emotion and Concreteness data

Data obtained from the interviews was transcribed by the researcher with the help of a transcription software. It was then statistically analyzed using R-Studio (R Core Team, 2015). False starts, pauses and other paralinguistic features were excluded from the transcribed data of participant narratives. The approach adopted in this study set out to explore the cognitive and linguistic processes which underlie figurative use of language in discourse (in this case a semi-structured interview). Quantitative analysis utilized an

obtained corpus consisting of 13,915 words ranked along the dimension of emotion. The emotional characteristics of these words were scored for their arousal, valence, and dominance attributes which were normed across 1,827 individuals. Metaphorical constructions observed in the data set were parsed individually by each word they were composed of. The resulting segmented words were assigned a corresponding emotional rating score (Warriner et al., 2013) and concreteness rating (Brysbaert et al., 2014) retrieved from the corpora.

Metaphorical and figurative use of language was assessed independently by the researcher and another reader who was a linguist. While metaphor theory literature suggests the use of various formats of a Metaphor Identification Protocol (Steen, et al., 2010; Pragglejaz, 2007) this was not feasible in this study as it would have required a training of several linguists who would then evaluate the figurative use of language in the corpus under investigation. Instead, each expression considered metaphorical was categorized and assigned into one of the three temporal groups: before, current, and future. This was done by classifying each response according to whether it was in reference to a particular time in the course of the participant's traumatic event representation noted in the narrative discourse. A weighted average of the data was performed for each participant to obtain an overall measurement of the frequency for both emotional valence and concreteness values within each of the temporal groups. Criteria for analyzing metaphors omitted contractions, pronouns, and other deictic elements. In addition, all inflected forms of the verb were transformed into their base lemma. The rationale for this transformation was twofold; firstly, it was determined that emotional

valence of a verb had the same emotional value generalized to each of its inflected forms (Warriner et al., 2013), and secondly, it was computationally simpler to analyze the data when organized in this manner.

Pearson's correlations were used to explore the interaction of metaphors with dimensions of emotionality and concreteness among demographic variables. A single factor repeated measures ANOVA was used to determine differences within the three temporal groups, and was performed for both emotional valence and concreteness values obtained. A significant result was further validated using a pairwise comparison technique, the Tukey's Honestly Significant Difference test to confirm whether the differences observed were statistically significant. To examine variability that can be accounted for due to individual differences, a linear mixed model was used to calculate the effect observed and the relative contribution of random and unpredicted data to the analysis of demographic variables. The fixed variable was demographic information obtained, and the random variable was indicated as the by-subject variability across all participants.

2.4.2 Analysis of metaphorical patterns

A linguistic analysis of the narratives was performed using a simplified version of the Metaphor Identification Procedure (MIP) (Steen et al., 2010) to determine, as objectively and systematically as it was possible, its metaphoricity. Variability in metaphor interpretation was reduced by validating metaphors found in the narrative by another linguist with expertise in metaphor theory (MS). Conducting analysis this way

establishes a higher level of inter-rater reliability and a degree of agreement in the collection of the metaphorical language data (Steen et al., 2010). The most apparent conceptual metaphor identified in the narratives collected was LIFE AS A JOURNEY (Lakoff and Johnson 1980). This finding corroborates the observations made by Costa and Steen 2014 who looked at semi-structured interviews with participants who self-reported PTG (Szymanski & Rosenfeld, 2014). Metaphors identified by the raters in the corpus collected for this study were further subdivided into categories by examining the source domain of LIFE AS A JOURNEY in more detail. This conceptual metaphor depicts the process of recovery after the traumatic experience as an ongoing event assessed using four major themes observed across all participants. The themes included the following submetaphors: barriers are perceived as an impediment to motion (further referred to as 'barriers'), progress is movement towards a destination ('distance'), actions are self-propelled motions ('actions'), and having a direction is a form of recovery ('direction'). Together, the event structure of the JOURNEY exists as a productive method to reveal metaphorical mapping in linguistic expressions and ultimately the mental representation of trauma (Kövecses, 2000).

The occurrence of a submetaphor was calculated by determining the frequency of observations among the three temporal variables of interest; reference to before the point of trauma, their current life, the future. The analysis removed repetitions of identical metaphors produced during the narrative. The rationale for this was to minimize bias in emotional affect scores since some participants tended to perseverate with certain metaphors. The repetitions of similar metaphors would shift the overall emotional scores

for each individual and become somewhat less representative of their overall use of emotion in metaphor. Each classified metaphor was put into a single submetaphor group, and was not used in any other grouping categories. Metaphors which did not meet the criteria for classification of any of the submetaphors were removed from this section of the analysis. Determining which metaphor belonged to a particular group was done with a careful examination of the metaphor types, noting the use of the metaphor in context and whether it met the central criteria of classification for one of the four submetaphor categories. This was done by identifying the conceptual scope of each metaphor and whether it could be understood according to one of the four categories' themes. Accordingly, a cognitive-linguistic approach to analysis focused on how these metaphorical patterns constructed a representation of traumatic events and, potentially, post-traumatic growth. A chi-square analysis was included, examining each of the four submetaphors across the three temporal distinctions, resulting in a 4x3 frequency distribution table. A correlational analysis was also performed to determine relationship between demographic variables and the frequency of submetaphor use in the context of trauma narratives. Themes that recurred throughout each individual interview were explored as they were thought to represent an aspect of how a person might represent meaning in the world around them and how they reconceptualized it through figurative recounts.

3.0 Results

Since trauma recovery varies greatly among individuals, a holistic approach in assessing their predicted level of healing and post traumatic growth is required. The analysis presented in this chapter is divided into two parts: observations of conceptual patterns underlying metaphorical constructions and the statistical procedures used to quantify emotional characteristics which comprise the metaphor under analysis.

3.1 Metaphorical patterns

Cognitive linguistic observations which emerge through the analysis of discourse consist of patterns in the use of metaphor characteristic of those who have sustained prior trauma. The analysis revealed that conceptualization of traumatic events reflects a journey with hindrances to this journey evident in any hurdles encountered throughout the time post injury (Lakoff & Johnson, 1980). In particular, the use of language by the participants interviewed for this study demonstrates that the concept of a particular motion captures their progress from the point of injury until present date. However, this motion tends to become altered when discussing outlook regarding the hypothesized trajectory of their recovery. Ultimately, this journey is positioned within the source-path-goal schema which reflects spatial and temporal representations.

Of particular interest is the fact that the conceptualization of LIFE AS A JOURNEY was characterized by four recurring patterns; namely, barriers, distance, direction and action. The purpose for using these patterns was their fundamental importance in human experience, and more specifically, trauma. These sets of basic conceptual patterns represent what is known as primary metaphors, and described as

"motivated by tight correlations between distinguishable dimensions of recurring, locally defined experience types" (Grady & Johnson, 2002). The primary metaphors examined were assessed for their frequency in the narrative and organized according to three temporal distinctions describing the traumatic event; prior to the trauma (past), current life (present) and where they wish to go (future). Frequency observations for each of these temporal dimensions were placed in a 4x3 Chi-square table (Table 1, in section 2.1) which revealed no statistically significant differences, $\chi^2(6, N = 210) = 2.418$, $p > 0.05$. The results suggest the data obtained are independent observations and show no statistical relationship between temporal distinctions and primary metaphor types. The distribution of the linguistic data is illustrated in Figure 1, section 3.1.4.

	Barriers	Distance	Direction	Action
Before	15	18	17	12
Current	18	19	27	21
Future	13	18	21	11

Table 2. *Frequency data comparing metaphor types and temporal domains for all participants*

3.1.1 Difficulties are impediments to motion (barriers)

Barriers observed in metaphorical patterns outlined obstacles encountered which may be internal or externally derived. External barriers tend to be those which place limitations on the daily life of the interviewees as a result of the traumatic event.

Evidence for this type of hindrance to motion can be seen in expressions referring to overcoming obstacles, whereby the traumatic event is represented as a physical impediment to motion. Evidence for this is demonstrated in metaphors such as, *"My reality has hit me in the face",* "*the brick wall I'm trying to go through",* and *"I'm stuck for life".* An examination of the observed frequency of this primary metaphor indicates a greater number of occurrences of barriers perceived in the present time (see *Figure 1, section 3.1.4).*

3.1.2 Progress is movement to a destination (distance)

The target domain of progress is captured by describing movements towards a destination. However, describing a relative distance travelled from the traumatic event to destination (goal) captures how those suffering from trauma position their life along the spectrum of recovery. This is demonstrated by spatially oriented terms anchoring recovery as the desired goal and their current frame of reference as the point of comparison. Across all individuals, short-term goals were prevalent describing their progress using smaller increments of distance travelled with such metaphorical language use as "*I'm still where I'm at", "I live in the now",* and *"I don't plan that far ahead".* The journey schema is often represented as a stretch of distance, or road, attributing difficulties or obstacles to the ease with which it is traveled as noted in "*it was a long road",* and *"I'll do it down the road".* At the endpoint, their goals, while in sight, appear somewhat unattainable according to their metaphorical accounts as evident from, *"being close [to what I was like]"*, *"it's out of my reach at the moment",* and *"until you get to that spot".* Together, progress as a function of distance provides a sense of perspective,

situating the recovery of a traumatic event in tangible and measurable ways which are conveyed through metaphorical recounts.

3.1.3 Direction as a form of recovery (direction)

The spatial framework for directionality situates the trauma sufferer as either taking an active or passive role in choosing a particular direction away from the traumatic event. Responses oriented with reference to the present time domain consist of a greater number of occurrences of optimism apparent from expressions that describe movement forward or up, e.g. *"I just keep living ahead", "it started to build up"*, and also *"get you in the right direction".* Contrastively, doubts about one's perceived recovery direction may be presented as a hindrance to movement or orientation as in *"I just don't know where I am going"*, and *"I'm at a dead end"*. Alternatively, passivity to trauma is observed whereby the individual has emotions and experiences surrounding the traumatic events thrust upon them, ultimately impacting their sense of direction. Evidence for this can be noted in *"the tears come all the time",* and *"you can't really… bring up the information".* The two distinct perspectives of an active or passive stance in these examples illustrate, broadly, patterns which are evident in capturing subjective sensorimotor experiences demonstrated in metaphorical language.

3.1.4 Actions are self-propelled motions (action)

Abstract action can be represented figuratively as moving your body through space. This representation examines purposeful movements towards the goal of recovery from a traumatic event. The event structure of the LIFE AS A JOURNEY metaphor is

seen in examples such as the following: *"I went through a lot of remorse"*, *"run through life the best I can",* and *"I'm trying to push myself".* In these metaphorical models, the basic logic of the journey is expressed through the source-path-goal framework where metaphor types illustrate this relationship along points in a path (Lakoff, 1987). The image schema of motion maps the conceptual metaphor of movement in space to the target domain of initiative and motivation towards recovery.

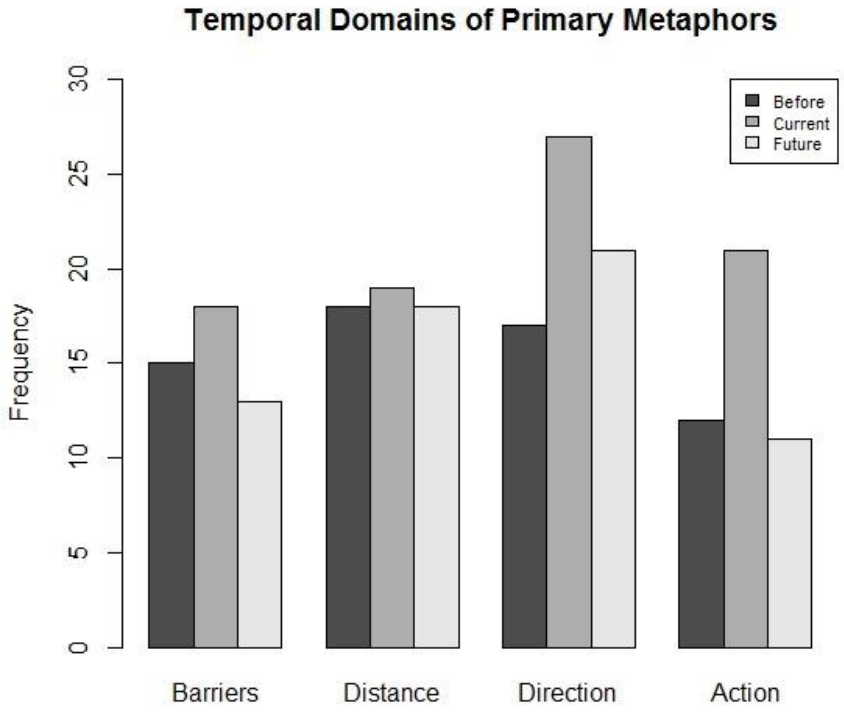

Figure 1. *Frequency of primary metaphors observed in the trauma narrative*

3.1.5 Demographic variables and Metaphorical Patterns

A further examination of the influence demographic variables have on the metaphorical subtypes observed reveals that the occurrence of perceived barriers is strongly linked to participant's age. There is a strong positive trend indicating that there

are greater frequencies of conceptual barriers found in metaphorical language for those who are older. The associations between these variables were shown to be significantly correlated ($r=0.68$, $n=13$, $p=0.009$). In addition, the amount of time post injury also was associated with greater number of occurrences of the barrier submetaphor ($r=0.66$, $n=13$, $p=0.01$) indicating that there are consistently greater numbers of perceived barriers evident in the narrative for those who have had a longer time elapsed since their time of injury. The relationship for these correlational trends are shown below in Figure 2. However, we are cautious to make inferences according to the aforementioned calculated significances given that time post injury and age are relatively strongly, yet non-significantly correlated ($r=0.53$, $p>0.05$). This states that those who have experienced longer times since their injury are also likely to be older in age, according to the sample data under examination. The remaining associations between the demographic variables and submetaphors were not statistically informative resulting in low correlations and non-significances when examined. The summary of each category is indicated in Figure 3.

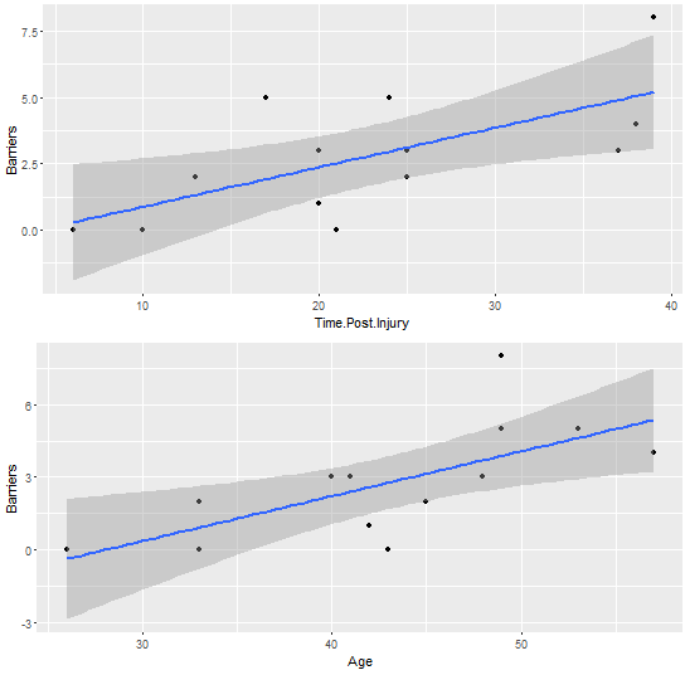

Figure 2. *Relationship between age, time post injury, and frequency of metaphorical barriers in the narrative*

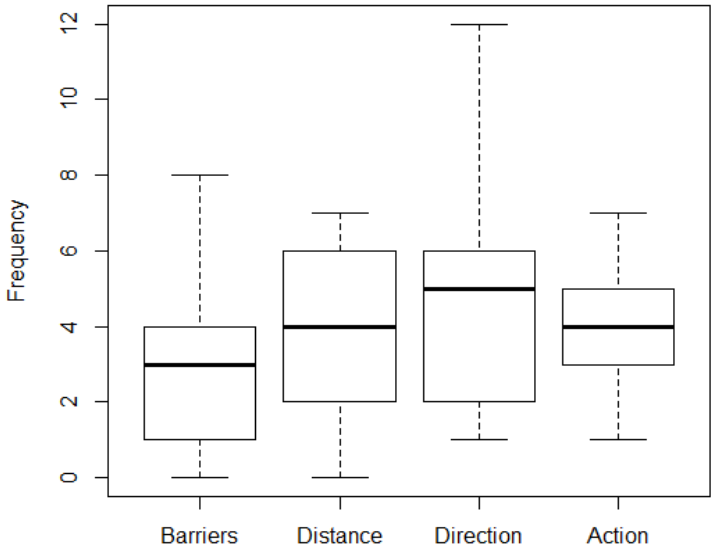

Figure 3. *Primary metaphor of Life as a Journey organized according to submetaphor domains. The data collapsed the time domain and examined the frequency of each type overall.*

3.2 Emotional Metaphors

Demographic variables used for the purposes of analysis were age, level of completed education, and time post injury as they have been shown to be reliable indicators of post-traumatic growth following an acquired brain injury. Grace, Kinsella, Muldoon, & Fortune (2015) examined the relative impact these key dimensions have on understanding outcomes following an ABI. The selected demographic variables have received support from the PTG literature as they are strongly correlated with PTG. With regard to age, older individuals report greater levels of PTG than younger persons. Longer pre-injury education, and longer time since injury was associated with greater levels of PTG. In light of these findings, the data in our analysis revealed education had demonstrated the strongest association in explaining the emotionality in metaphor whereas time post injury, and age failed to reveal a significant correlation. The non-significant observations apply even when considering demographic variables in relation to temporality (i.e. before, current, future). Although, the data departs from the conventional assumptions of the strong influence which demographic variables have in PTG, its relation in metaphorical constructions is more variable. Positive emotions and outcomes associated with PTG are likely to occur along a continuum with differing conceptualizations and degree of growth experienced. Additional data and participant sampling are required to confirm whether metaphor and demographic information can reliably provide information about positive emotional shifts that occur following trauma, as found in PTG.

3.2.1 Emotional valence

A single factor repeated measures analysis of variance (ANOVA) was used to determine the emotional valence in metaphorical constructions which capture temporal aspects of participant experiences before the injury, currently, and their future outlook. The test was performed with Time (before, current, future) as a between-subjects factor and participants as a within-subjects factor. The objective for performing this type of analysis was to examine the variability that exists across each individual independently within this sample (within-subjects). Additionally, we were interested in the relation for each section of time (before, current, future) and how it varies with respect to the measure of emotional valence (between-subject effects). There was a significant difference among the emotional valence scores characteristic of metaphorical constructions which differed across the temporal domain (i.e. before, present, future), $F(2, 12)=8.846$, $p=0.0013$. A post-hoc Tukey's HSD[5] test revealed significant differences in emotional valence between the before group and future group, $p=0.0016$, as well as between the present and future group, $p=0.01$ using a 95% family-wise confidence level.

[5] This test is performed after the ANOVA as a method to compare statistically significant means through multiple pairwise comparison procedures.

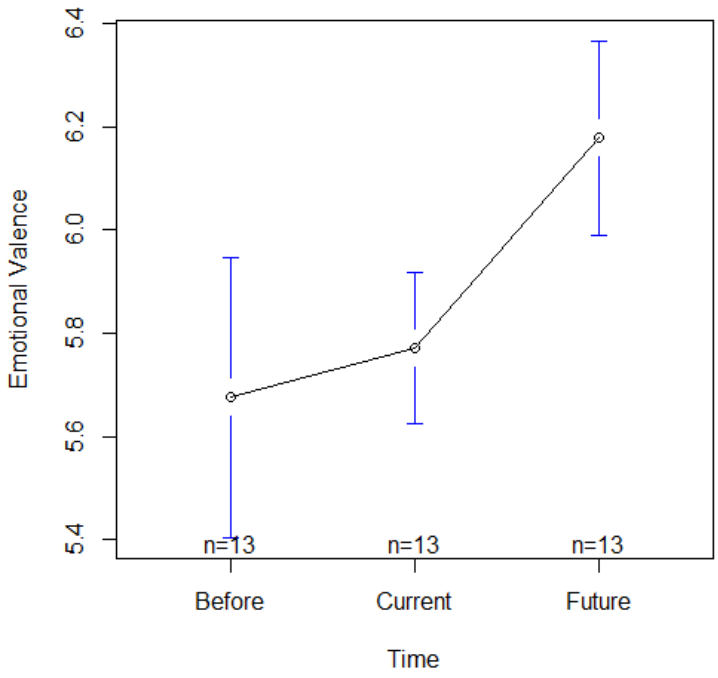

Figure 4. *Plotted means of emotional data across temporal groups for all participants Vertical lines indicate error bars with 95% confidence interval*

3.2.2 Demographic variables and emotion

Correlational data indicates no statistically significant relationship between *Age* (r=0.06, n=39, p=0.71), *Time Post Injury* (r=0.08, n=39, p=0.60), and *Education* (r=0.26, n=39, p=0.10) with respect to emotional valence. This was constructed using a two-tailed test with the significance level of $\alpha=0.05$. A scatter plot of the data was designed to determine the relationship and degree to which the temporal variables (before, current, and future) predict emotional valence. To determine how well the regression model predicts responses for new observations, a multiple regression was calculated to determine the relative influence of demographic variables. A significant regression was found $F(5, 33)=4.489$, $p=0.003$ with an $R^2 = 0.41$, and an adjusted $R^2 =0.32$. Among the

variables, education was a significant predictor of emotional valence in this model, p=0.03. Collectively, all demographic variables included in the study contributed to explaining 32% of the variance observed in the model of best fit. A main effect for temporality was found in Age and Time Post Injury factors with Future. This provides statistical evidence that emotional valence is notably different, and associated with more positive language, when metaphors refer to future events. As well, the interaction of before and current time domains with Age and Time post injury suggests that these variables may be somewhat dependent on each other.

The values were fitted with a linear regression smoothing function using the R Studio package *ggplot2* (Wickham, 2009), (See Figure 2). The data outlined collapsed the three temporal dimensions examining the relationships collectively. Despite the non-significant results, the data does follow hypothesized trends which are characterized by more frequent occurrences of positive emotional affect according to metaphorical constructions observed.

3.2.3 Affective disorders and emotional valence

Given the possible impact which affective disorders, such as depression, place on emotional processing and production (Bornhofen & Mcdonald, 2008), an additional analysis was performed removing individuals who have a current diagnosis of affective disorder according to the clinicians working under the BISH rehabilitation centre. To test the non-affective group of participants, a single factor repeated measures analysis of

variance (ANOVA) was conducted to determine the emotional valence in metaphorical construction, F(2, 8)=5.483, p=0.0154. The significant difference was further investigated using a Tukey HSD with multiple comparisons and it revealed less robust results across the temporal dimension. A significant effect was shown for observations of emotion data between the before and future group, p=0.012. The results indicate that emotional valence in metaphorical constructions seems to be, in part, affected by disorders impairing one's mood either as a result of the acquired brain injury, premorbid diagnoses, or other extraneous variables which extend beyond the current study design.

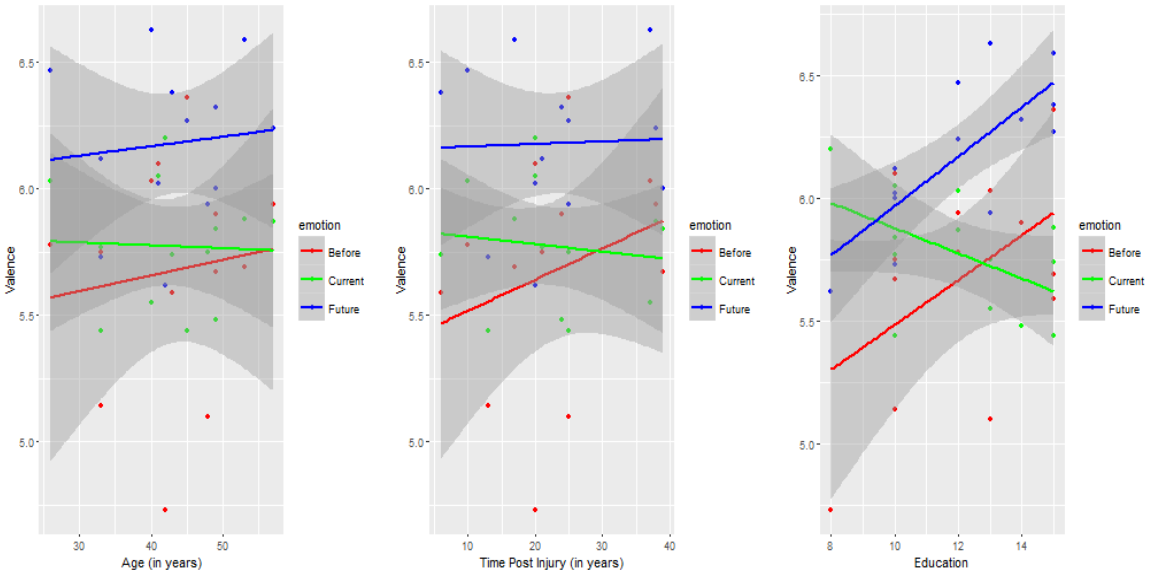

Figure 5. *Regression models of demographic variables and emotional valence.*

3.3 Concreteness

A single factor repeated measures analysis of variance ANOVA was used to analyze effects of concreteness in metaphorical expressions across the three dimensions (i.e. past, present, future). There were no significant differences observed, F(2, 12)= 0.673, p=0.52.

Figure 6 in section 3.3 shows that as metaphors extend further in the time domain (e.g. past towards future) metaphors steadily shift from concrete to abstract. This is indicated below with mean values of the metaphorical observations and their level of concreteness across all participants.

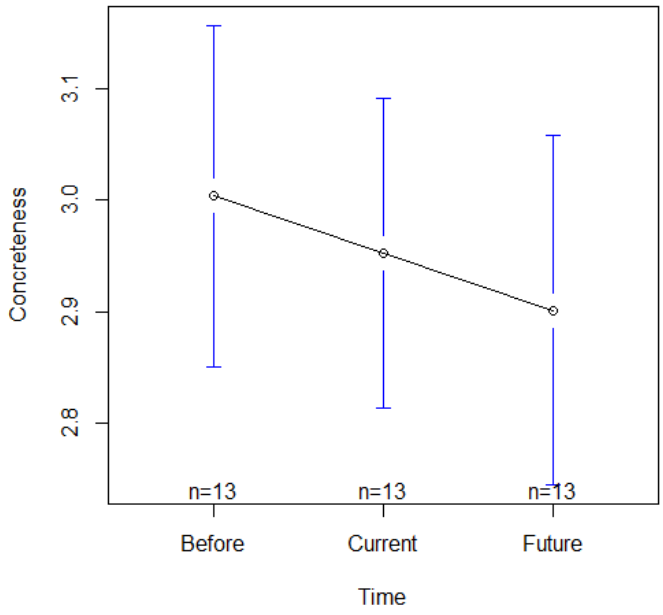

Figure 6. *Plotted means of concreteness across temporal groups for all participants. Vertical lines indicate error bars with 95% confidence interval*

3.3.1 Demographic variables and concreteness

The data was first examined using correlational analysis to determine any trends in the relationships among the demographic variables of interest. The results revealed very near, or marginally significant data using a two-tailed test with an α=0.05. More specifically, the relationship explored between *Age* (r= 0.31, n=39, p=0.057), *Time Post Injury* (r=0.32, n=39, p=0.05), and *Education* (r=0.04, n=39, p=0.82) was compared to measures of concreteness in metaphorical constructions. The level of concreteness

measured is represented as a scale from 1 to 5 which indicate values going from abstract to concrete, respectively (Brysbaert, Warriner, & Kuperman, 2014). A scatter plot of the data was designed to calculate the degree of predicted relationship among demographic variables and concreteness. The values were fitted with a linear regression smoothing function using the R Studio package *ggplot2* (Wickham, 2009), (See Figure 7, section 3.3.1). The figure below demonstrates a consistent positive trend for both Age and Time post injury as it relates to concreteness. Overall, metaphors become more concrete with older age and longer times since injury, and this extends across all three temporal domains observed. The education demographic information is more variable across the temporal dimensions but indicates a slight positive trend for the current and future temporal domains. As such, higher levels of education suggest increased concreteness in metaphor for both current and future representations.

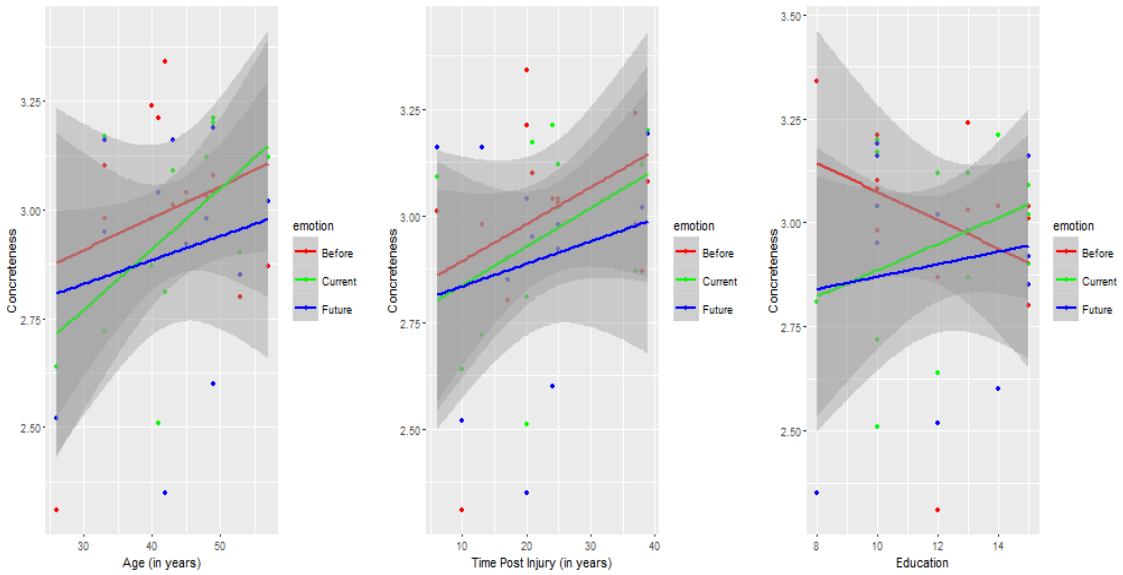

Figure 7. *Regression models of demographic variables and concreteness*
The shaded area represents a 95% confidence interval for regression slopes

3.4 Linear mixed effect models

Persons with acquired brain injuries often constitute a very heterogeneous population, since, given the variability in nature, location, and extent of an injury, a similar diagnosis across individuals may vary widely. As such, a more sophisticated approach to better approximate the emotional data obtained utilizes a linear mixed effects model using the *lmer* function from the *lme4* package (Bates, Maechler, Bolker, & Walker, 2015) in R studio. A linear mixed effects analysis of the relationship between emotional valence and the three temporal dimensions was used to determine whether any other possible factors significantly affect the response variable of emotional valence. Prior to analysis, the data was checked to determine whether assumptions of a normal distribution and homoscedasticity (homogeneity of variance) were met and did not reveal any deviations according to a visual inspection of the residual plots.

The *lmer* test derives p-values based on the Satterthwaite's approximation of degrees of freedom. P-values were obtained by maximum likelihood ratio tests of the full model with the effect in question against the model without the effect in question. The model used the value of emotional valence as the response variable and the time domain as the predictor. Given that each subject has an idiosyncratic amount of variability, the model accounts for this by assigning by-subject as a random effect variable. Statistical models were created using a forward and backward fitting model approach using the demographic variables of interest. The fitting process included age, education, and the amount of time post injury as possible influential factors. In the full model, which included all demographic information as fixed effects, education was the only predictor

which significantly improved model fit, b = 0.06, t(39) = 2.5, p= 0.017). None of the other remaining predictors were shown to significantly improve the model fit.

3.4.1 Fixed effects

To test for the significance of demographic variables with regards to the temporal dimensions (i.e. past, present, and future), a model comparison was used to compare models with and without age, education, time post injury, respectively. Education was the only predictor that approached significance in improving the model, as observed in *Table 2.* However, concreteness was not significantly affected by any of the predictors of interest. The amount of time post injury was the only predictor which nearly approached significance, b=0.008, t(35)=2.002, p=0.053.

3.4.2 Interaction

A motivated interaction which requires examination exists between the possible influence of the amount of time elapsed since the date of traumatic brain injury (i.e. time post injury) and the emotional metaphors with reference to three distinct points in time. The model which includes the interaction was shown to significantly affect emotional valence, ($\chi^2(1)=4.107$, p=0.042) with a positive increase in valence for the *Before* (intercept), 4. 76 ± 0.40, *Current* , 0.44 ±0.31 , and *Future* group, 0.76± 0.32. This was directly compared to the model with no interactions and only the demographic variables as fixed effects.

Variables	**Coefficient**	**t-value**	**Significance**
	Fixed effects		
Intercept	5.09±0.33	15.395	p<0.001
Current	0.09± 0.12	0.806	p=0.425
Future	0.504±0.12	4.19	p<0.001
Age	-0.009±0.008	-1.123	p=0.268
Education	0.06±0.023	2.497	p=0.06
Time Post Injury	0.009±0.006	1.456	P=0.153
	Interaction		
Time x Time Post Injury (TPI)			
Before x TPI	0.02±0.01	1.73	p=0.09
Current x TPI	-0.02 ±0.013	-1.19	p=0.24
Future x TPI	-0.01±0.013	-0.88	p=0.38

Table 3. *Estimates of fixed effects by a linear mixed model with by-subject as random effect. N.B. The reference for this model is the temporal before group. Interaction model maintained fixed effects as it significantly improved the model fit. *The coefficient in the table is comprised of the values obtained for the estimate and the standard error, respectively.*

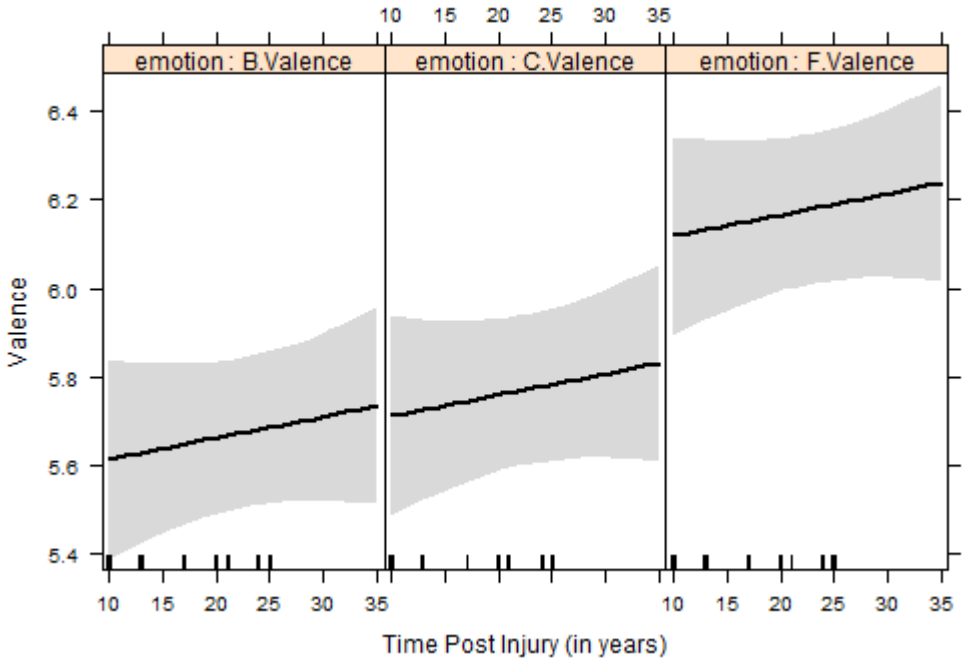

Figure 8. *Partial effects plot of Time Post Injury by Time interaction and Valence holding Education at a constant. *B.Valence, C.Valence, F.Valence represent before, current and future temporal domains, respectively.*

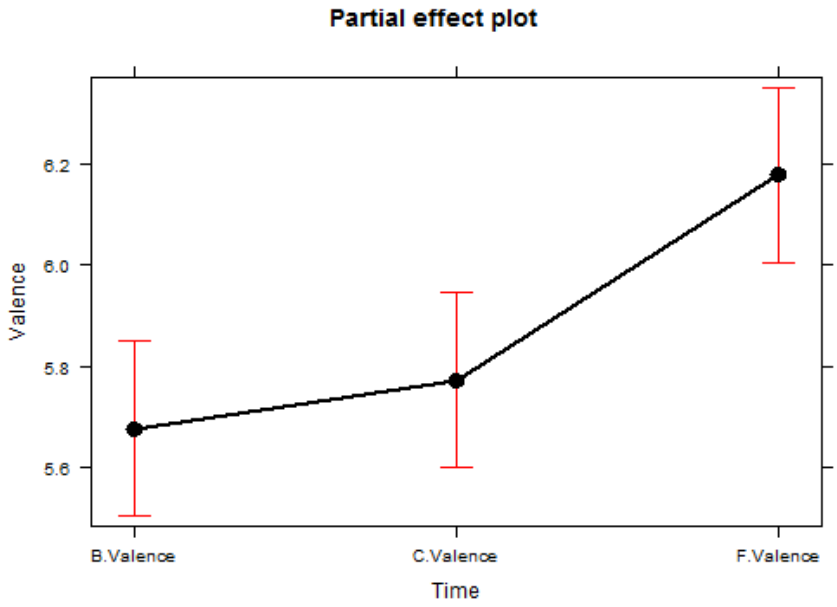

Figure 9. *Partial effects plot of Time and Valence holding all fixed effects constant.*

4.0 Discussion

The present study used a semi-structured interview format to elicit recall of traumatic events experienced following an acquired brain injury. The purpose of this study was to explore the occurrence and impact of metaphorical language identified through (1) emotional valence, (2) concreteness of language, and (3) the interaction of metaphorical themes with emotion. Taken together, the analysis of these variables allow for certain conclusions regarding the presence and degree of PTG. We address the temporal representations of trauma evident in description of past, present and predicted future events.

4.1 Emotional valence

After an investigation of emotional valence and its role in metaphorical constructions observed within discourse, we noted increased positive emotional affect when moving from past to present, and future temporal representations (*See Figure 4, section 3.2.1)*. Therefore, metaphors which refer to different points in time are composed of increasingly more positive words. This is seen in Figure 4, section 3.2.1 which reflects this trend. Consistent with previous related literature, Jaeger, Lindblom, Parker-Guilbert & Zoellner (2014) found that emotional content of trauma narratives (positive and negative emotion words) was strongly associated with lower symptomatology. In particular, the use of emotion words was associated with lower trauma related reactions such as depression, anxiety, dissociation, and anger. The fragmented or disorganized

grammatical structure of trauma narratives, on the other hand, failed to reflect underlying emotional processing of traumatic memories. This could point to a more complex association between symptoms of trauma and a micro- and macro-linguistic analysis of the narrative alone (Marini et al., 2011). It could be the case that cognitive-affective networks in memory recall, often impaired following ABI, affect perceptions processed by negative neural pathways more than those processed by positive neural pathways (Sherratt, 2007), and are independent of arousal (Adelman & Estes, 2013). As a result of these affected negative pathways, the data collected in our study could be biased towards an inflated sense of positive language. However, this has not been clearly established when examining emotional valence and mainly observed in recognition of overt emotional stimuli among broad emotional categories such as anger, happiness, and sadness (Ben-David, van Lieshout, & Leszcz, 2011).

Furthermore, positive affect documented among participants who suffered acquired brain injury was shown to be indicative of greater psychological health observed in an analysis of PTG inventories collected (Prati & Pietrantoni, 2009). In their study, testing scales used to analyse data equated positive outcomes following a traumatic experience directly with positive growth. A possible question is whether such a claim can be substantially made, considering that measures of emotional affect were derived from data collection methods which limit emotional expression to a finite set of options that include: optimism, social support, and coping strategies. Conversely, the measures adopted in the current study draw from participant raw figurative expressions which were then transformed using emotional corpora ratings, and may be more representative of

emotional status across mental representations of time. The relationship here illustrates the progression along the narrative documenting emotions in metaphors as they shift with respect to different points in time. In essence, it can be observed that most participants, regardless of all demographic information assessed, were willing to generate metaphorical language freely to capture past emotional experiences with increasingly positive representations extending forward in time. Given that longitudinal studies examining emotional self-disclosure about perspectives on trauma were found to be one of the best predictors of PTG, it seems potentially advantageous to examine the data in this manner (Tedeschi & Calhoun, 2004).

Interestingly, level of education was associated most strongly with changes observed across the dimensions of time. This is in accordance with results reported which identified education as a significant predictor of post-traumatic growth in acquired brain injuries (Gangstad, Norman, & Barton, 2009). Further evidence for this, as previously noted, identified premorbid level of education as notably improving outcomes, with higher education leading to positive cognitive restructuring (*See Figure 5, section 3.2.3*). Evidently, the integrity of the brain post-injury was purported to be less affected according to the notion of cognitive reserve given that education is a major determinant (Schneider et al., 2014). The cognitive reserve hypothesis posits an explanation for the variability found between the location and degree of brain injury and how recovery outcome is expressed. In this framework, higher levels of educational attainment are associated with greater capacity for developing cognitive reserve (Rassovsky et al., 2015; Schneider et al., 2014). Among individuals having sustained a brain injury, vulnerability

to effects of damage following trauma and psychosocial outcome are supported by understanding injury characteristics of the sample used. By being able to connect the brain's ability to adapt and compensatory tools to predicted recovery, aspects of cognitive reserve and the influence of education can be more clearly understood (Schneider et al., 2014).

The cognitive reserve hypothesis provides particularly meaningful implications to the results of this study as it could explain the degree to which TBIs and more acute injuries, such as stroke (Elkins et al., 2006), impair functional, as well as emotional recovery. In particular, the hypothesis posits a possible explanation for the incongruence between severity of injury and clinical signs following trauma. Accordingly, the data illustrates a case for this when examining individual differences of time post injury and education affecting emotional valence. The results suggest that even when trauma is fairly recent (i.e. a shorter time post injury), temporal representations of emotion illustrate a steadily increasing growth of positive emotional outcome even when holding education at a constant (*See Figure 8, section 3.4.2).* Although the current study was not able to directly equate type of brain injury with its severity, due to limited access to client medical information, an attempt at connecting the intensity of traumatic events was made for more recent points of injury. It was the author's belief that in connecting the data in this manner would be the closest accessible means to explore intensity of trauma, albeit somewhat indirectly. A further examination of clinical testing gauging severity of injury using standardized measures with highest educational attainment is needed to disentangle the effects of cognitive reserve more clearly with respect to the current study design.

Post traumatic growth experienced by individuals with higher levels of pre-injury education partly accounts for the positive emotional trends observed in the present study. Grace, Kinsella, Muldoon, & Fortune (2015) systematically review meta-analysis data for eight studies examining the extent to which demographic variables, injury factors, subjective beliefs, and psychological health are associated with PTG following ABI. The results of their study show that personal growth and positive outcomes - despite injury severity - indicated the beneficial role of longer education. The results demonstrated that individuals who have completed more education indicate moderate and significant potential for PTG following and ABI (Grace, Kinsella, Muldoon, & Fortune, 2015), although these views have been challenged by others arguing that PTG in this instance is a result of emotional coping mechanisms and personality factors (Affleck & Tennen, 1996). Since the participants in the current study possessed fairly narrow range of education levels (12-14 years, See *Table 1, section 2.1),* it cannot be concluded that the education variable is a generalizable indicator of positive affect shift suggestive of PTG. The data requires some caution in its interpretation, although its contribution to the statistical model did provide a noticeable effect in improving fit among observed data.

4.1.1 The Role of Affective Disorders

An analysis of affective (n=4) and non-affective (n=9) group consistently showed significant results, indicating that emotional differences pattern in a similar way even in the absence of clinical diagnoses of affective disorders. Depression has traditionally been associated with altered emotional processing post-TBI (Sherer & Sander, 2014).

However, when examining group-wise differences regarding emotional metaphor expression, there were no observed statistical differences between those with and without depression . Similarly, the use of positively represented metaphor was shown to reliably index a better outcome and positive change in depression (Levitt, Korman, & Angus, 2000). The subsequent analysis isolating the effects of any clinical emotional changes shows that there is a moderate indication to suggest it does not contribute in a significant way to emotionality of metaphor. While larger samples are required to clearly establish this link, the presence or absence of mood related disorders according to this subset of data does not have deleterious effects on the emotional content of metaphor (*See section 3.2.3*). It should be noted that adaptability to symptoms and pharmacologically mediated reasons could impact overall emotionality attenuating valence measures.

4.2 Concreteness

An examination of concreteness within metaphor suggests a monotonically decreasing relationship observed across dimensions of time (*See Figure 6, section 3.3*). The obtained results correspond well with predicted qualitative measures which document metaphorical representations of distant events in time more abstractly as it is a hypothesized or idealized outcome. This is of particular interest since higher cognitive functions such as abstraction are particularly sensitive to diffuse brain injury (Salas & Coetzer, 2015). Therefore, the trend observed should indicate greater overall concreteness for the early time post injury group, with more literal forms of expressions produced. In fact, an opposite trend is observed for the use of figurative language, whereby more

recent times post injury are uniformly associated with more abstract metaphor use compared to those with more time elapsed across all temporal domains. This finding applies to the use of metaphor among the participants and does not extend to the total discourse data itself.

One explanation to account for the change in concreteness may be due to uneven groups of individuals that have early time post injury with later time post injury. The majority of participants enrolled in the study experienced an average of 22 years from the point of injury (*See Table 1*), while only two individuals experienced injury relatively recently (≤ 10 years). As such, controlling for participant demographic information would further clarify whether these changes in concreteness generalize to a wider sample. A second rationale for the explained differences from previous research is that metaphor processing for those with ABI is variable and may be better explained according to the region of the brain implicated in the trauma (Rinaldi, Marangolo, & Baldassarri, 2004; Yang, Fuller, Khodaparast, & Krawczyk, 2010). Since concreteness/ abstractness represent different aspects of complex linguistic stimuli, understanding metaphor use hinges on areas of the brain specialized in handling comprehension. In order to properly represent an emotional experience, it requires broad associative networks between features connecting elements of metaphor. Specialized areas responsible for these tasks have not been generally agreed upon, with some identifying left hemisphere advantage, while others relate the right hemisphere to processing metaphor. Previous studies have shown that literal (i.e. concrete) language and figurative (i.e. abstract) language activate

two very different regions, which may be sensitive to diffuse brain injuries (Bohrn, Altmann, & Jacobs, 2012; Citron, 2012; Schmidt & Seger, 2009).

Of particular interest is the relative importance which Age and Time post injury plays when examining the concreteness results in greater detail (*See Figure 7, section 3.3.1*). In particular, the regression model suggests a statistically significant correlation between these variables as they relate to concreteness. It follows that as age and time post injury increase, metaphors become progressively more concrete. This is somewhat different than evidence which notes that the general language use immediately post trauma is more concrete. According to Judith Herman (1992), even if a trauma survivor talks about their experiences, it is done as a form of a "pre-narrative", ['it does not develop or progress in time, and it does not reveal the storyteller's feelings or interpretations of events'] (Herman, 1992: 175). A trauma narrative is a reflection of episodic memory of events, based on sensory experience, which differs from non-traumatic event memory, based on narrative and meaning attribution (Anker, 2009). However, when examining specific examples of metaphorical mapping of traumatic events, immediacy of trauma is presumably associated with greater instances of dissociation and ultimately greater likelihood of abstract language when the experience is talked about after some time. The representations of abstract concepts are less likely to be grounded in sensory-motor simulations (Pecher, Boot, & Van Dantzig, 2011) and likely function as a mechanism of psychological distance from a traumatic event. Holding their negative experiences at a distance can help rebuild identity by separating the issue from the self in order to examine details and move towards creating a resolution (Morris,

2004). The main effect of before temporality for early time post injury in Figure 7, panel 2 demonstrates this fact, illustrating metaphorical accounts of the past as independent from other dimensions of time. In this study, the observation extends for all participants regardless of amount of time post injury.

A possible explanation for our finding of the consistent patterns of abstract metaphors observed for shorter time post injury and younger age demographics may be due to effects of episodic memory. The effects of concreteness and abstractness was examined in a study by Crutch, Connell, & Warrington (2009) showing that concrete concepts rely more heavily on semantic similarities, and abstract concepts on semantic associations. Because people do not have direct sensory-motor referents for abstract words, episodic memories of recent traumatic events are less likely to be reactivated with more abstract, as opposed to concrete, language used during narrative recall. Accordingly, episodic memory is elicited under similar situations to those experienced in the past, with similarities based on the amount of association described when recalling traumatic events. As a result, responses would orient towards increased abstractness to avoid the potential for evoking adverse memories during the narrative. For some participants who were interviewed, there were clear boundaries in what and how much was disclosed surrounding time prior to trauma, so avoiding these strong emotional reactions would be a viable means to prevent triggering strong negative reactions.

A further issue to be considered is determining whether concreteness and imageability[6] in this study are conflated with each other. The two variables are intricately connected as the referent of a concrete word is more easily imaginable than that of an abstract word. This finding was further elucidated in a study by Warriner, Kuperman, & Brysbaert (2013) which demonstrated that words which make people "feel happy" (i.e. those that have higher emotional valence) are easier to picture. In this instance, it is difficult to parse the directionality of the relationship to determine whether the concrete words used in the figurative language reflect the experiences of happier individuals, with increased opportunity to achieve PTG, or whether happier individuals tend to use more concrete language. The results require further analysis to isolate which of the two variables exerts primary influence on the other. An understanding of this fact would greatly inform research on concreteness of metaphorical language in trauma. The application it has within trauma narrative could provide insight to the domain of PTG.

In a similar vein, concreteness in language used among persons with TBI could potentially be a product of concrete thinking. Concrete language could be understood to alter emotional states as seen in behavioural changes following trauma. Concrete thinking is related to the inability to initiate changes in the structure of the self which modify temporal and representational domains. According to Salas & Coetzer (2015), people with moderate to severe TBI are particularly impaired in the temporal integration of experience comparing past (hindsight), and present with the future (foresight) self. The

[6] Imageability is defined as the ease with which a word gives rise to a sensory mental image (Paivio, Yuille & Madigan 1968).

examination of time, in conjunction with verbal abstraction, is a common deficit experienced in TBI (Christensen et al., 2008). Verbal abstraction examines one's ability to draw relationships between words, allowing for the connections between words in a literal or figurative sense. An additional consideration of our current study was that all forms of traumatic events collected were combined for the purposes of analysis. This was performed by collapsing both TBI (i.e. physical trauma) and non-TBI (i.e. stroke, hemorrhage) events that possibly affect concreteness in metaphor. No research to date has explored the differences in concreteness and abstract language that may exist between stroke victims and TBI patients. A review of the literature reveals the emphasis on TBI and linguistic impairments that result. The current study attempted to isolate for the TBI/ non-TBI distinction in a subsequent analysis. The results suggest that metaphorical language does not appears to be affected according to the two groups of injury types, since a detailed analysis controlling for only TBI group and removing n=4 subjects revealed similar trends of concreteness. Significant correlations were found across all three temporal dimension for both age ($r= 0.49$, $n=27$, $p=0.008$) and time post injury ($r= 0.50$, $n=27$, $p=0.007$).

4.3 Metaphorical event structure and JOURNEY schema

Narratives of traumatic events may posit LIFE AS A JOURNEY to represent a potential framework for moving towards recovery, and possibly, post traumatic growth. The metaphorical patterns emerging identified four critical submetaphors characteristic of conceptual metaphor theory.

4.3.1 Barriers

The participants represented some events and experiences as metaphorical obstacles that obstructed their movement along their life path. Examples include: "*Substance abuse has gotten in the way*", "*I can't get over it*", "*I've hurdled some big, big obstacles*", and "*I'm stuck in the corner*". The perceived barriers imposed by the traumatic event described were considerably less frequent than other three types of submetaphors (*See Figure 1, section 3.1.4*), overall, with current temporal frames of reference showing the greatest number of barriers. The lower frequency of the barrier metaphor is predictably in line with hypothesized outcomes of individuals achieving post-traumatic growth. The results suggest that there is less metaphorical obstruction observed in the use of figurative language, overall, with this submetaphor having the lowest frequency of observations. In this case, patterns of motion appear to be less impeded, allowing ABI-sufferers to conceptualize their future life in a more positive light with an uninterrupted path towards the destination of recovery. An additional consideration is that these shifts could reflect dispositional traits, or an attitude fostered within the rehabilitation centre itself. A shift in cognitive schema is something that cannot be reasonably forced but the way in which trauma survivors are experiencing these adverse events could be modified, redefining their lives with some level of optimism. This is further verified by the data as decreased barriers are also associated with positive emotional valence in metaphorical language.

Of interest is the relationship this submetaphor has with demographic information such as age and time post injury (*See Figure 2, section 3.1.5).* A strong significant

positive trend highlights that with older individuals and longer times post injury comes greater frequency of barriers. This is reasonably understood given that many individuals experience difficulties reintegrating themselves back to the way life was prior to trauma. In addition to this, there were added stressors of life being seen as unsustainable due to their physical or cognitive limitations. The participants viewed it as increasingly difficult as the demands to continue their responsibilities in life were challenged by the limitations to do so. It seems that younger participants might possess more resiliency and adaptive skills needed to move forward with added guidance along 'the journey', a marker of PTG. Similar observations have been reported in a study by Tedeschi & Calhoun (2004) proposing an explanation that describes younger people as more open to learning and change needed for PTG. By contrast, elderly people may be less receptive to change, as they have already learned their life lessons and do not necessarily long for any additional growth. Further evidence regarding age related explanations and indicators of growth comes from Affleck & Tennen (1996). They found that adaptive beliefs about the consequences of adversity, labeled as benefit-finding cognitions, associated significantly with each subscale of post-traumatic growth inventory. It was reported that experiencing trauma at a younger age and finding benefits from a life changing event may implode one's worldview of social order, allowing for a greater reconstruction of previously held worldviews and acting as a catalyst for growth (Helgeson, Reynolds, & Tomich, 2006).

4.3.2 Distance

This particular metaphor equates progress made with distance traveled from the point of departure or distance from a goal. Examples include: "*I haven't gone backwards*", "*close from getting to that goal*", "*until you get to that spot*", and "*going nowhere*". Within the framework of trauma recovery as a journey, the amount of progress is represented as distance traveled using measurable terms to suggest the magnitude of perceived recovery (Lakoff, 1993). According to the data collected, the greatest distance traveled is evident in the narration of current events. Contrastively, little to no movement is apparent in the before and future time grouping. Throughout the interview process, a common thematic pattern emerged in which emphasis was placed on "*taking things one step at a time*" and a variety of semantically related metaphors. In adopting this mentality, distance traveled could be somewhat masked in the production of metaphor by minimizing the actual progress made by only recognizing the temporally most immediate preceding and following accomplishments. Relatively equal occurrences of before and future metaphors are observed within the Distance category, as noted in Figure 1, section 3.1.4. Some examples which illustrate this can be seen charactering past temporal events. They include: "*I wouldn't go out on a limb and try it*", and "*I had to take it step-by-step*". Future events are similarly emphasized as in, "*The past is the past- only future*", and "*living in my future*". Temporally current domains are found to consist of metaphors such as, "*back to the way I should be*", and "*back to the normal life*".

The image schema of distance typically refers to spatial experiences integrating visual, tactile or motoric actions. From this, the actions described within the conceptual metaphor can be perceived as mentally mapped to more concrete terms. One method to

connect image schemas of distance with embodied experiences relates the conceptualization of space in order to fully understand the concept of time. In particular, the metaphorical *Distance* traveled is affected by obstructions which are characterized through the *Barriers* submetaphor event structure. Here, increased frequency of perceived barriers is strongly associated with more frequent metaphors of distance. This is somewhat less intuitive since it is opposite to what would normally be predicted given the relationship between the two domains. One could expect that many barriers on the path of the journey would limit the Distance traveled. In addition, the observations of *Distance* and the *Direction* domain are also intricately linked and possibly not entirely mutually exclusive when we examine them through the lens of trauma. A further analysis of these concepts connects the two domains within a spatial-temporal framework, with greater frequency of directional metaphors significantly associated with increased instances of more distance traveled across all participants.

4.3.3 Direction

Directionality was the most common theme exhibited, with progress seen in spatially-oriented terms. In the corpus of metaphorical language collected from the interviews, progress has been represented in space and associated with forward and upward movements, while undoing/reversing or lacking progress has been portrayed in in terms of backward and downward movement directional patterns or stagnation. This is exemplified in sentences demonstrating progress as in, "*looking forward*", and "*a future ahead of you*". The example, "*go back [to my old life]*" may suggest opposing forces to

metaphorical progress but for most participants going back to the quality of life prior to ABI may be the ultimate destination. Since the concept of time is not directly perceptible through the sensory organs, representations of abstract time are often grounded in the domain of physical space through metaphorical extension (Bender & Beller, 2014). Physical and social bases for metaphor of emotion and progress are often related according to the self with positive emotions or events principally characterized by the upward movement as in, "*it started to build up".* Conversely, negative emotions and events are represented as downward movement, observed in "*my life really went downhill"*. Indeterminacy is portrayed as a combination of both directions, *"I don't know whether my health is going up or down",* and *"here, there, and everywhere".*

In this domain direction is often represented as a linear path leading towards various points along the journey. In the context of trauma narratives, a common pattern emerges showing the participants' struggle to return to this linear path of travel as in, *"we're getting back on the right track",* and *"there is a path, you either take the bad path or the good path"*. A universal account characterizes a journey by defining the path mapping elements of one domain onto one or more elements of the others (Lakoff, 2003). In this case, the traumatic event acts as a deviation in some way from this idealized path, with the participant's life prior to the traumatic experience and their goals contrasting with increased sense of direction towards the future. This is evident in Figure 1, section 3.1.4 which shows a large increase in frequency from the before to future group. The data shows greater contribution of direction among the metaphorical patterns observed across all participants. This is found in more frequent metaphors which illustrate the

direction of moving ahead with fewer instances of moving backwards and otherwise oppositional language. Examples illustrating this are: *"I've grown up quite a bit", and "moving forward [in life]",* in contrast with *"[feeling] more down", and "going backwards".*

4.3.4 Action

The action metaphor in the context of trauma narratives positions the individual in terms of their volitional motion. Specifically, the core of this metaphorically conceptualized meaning in the event structure expresses intention to engage in purposeful movements towards a goal. In the interviews, the concept of transcending barriers was represented using key prepositions such as "through", as in *"went through a lot of remorse", "run through life", "push through my injury",* and *"through the problems"*. The current temporal domain contained a considerably greater number of instances of purposeful actions compared to the past and future. Examples include, "*it[a prosthesis] gets me around*", "*I put my day in*", and "*I switched to the side*". Overall, most participants used metaphorical domains with gradually increased agency. A prototypical agent is an entity that purposefully initiates an event, is sentient, and its action causes change of state or movement. In comparison, trauma narratives collected for the purpose of this study demonstrate somewhat less agency and increased passivity of the narrator. Since trauma following an ABI removes some elements of control in one's life, given its unpredicted nature, it poses the possibility of viewing one's actions from a passive perspective. In this instance, progress (moving forward) is less of a self-propelled motion

but rather a result of circumstances, something that happens to an (inanimate) object or a rather passive experiencer. This observation is more frequently found in metaphorical language among those participants in our sample who have met the DSM diagnosis for clinical depression. Examples of removed agency from those participants include: "*it comes back and hits me with depression"*, *"my reality has hit me in the face"*, and *"I had a brain tumour coming".* Here, negative events surrounding trauma could be interpreted as acting antagonistically to the participants' actions, in this case against the journey through the recovery process. This briefly illustrates that actions for these individuals are experienced and subsequently represented differently in metaphorical event structure in comparison to those without a clinical diagnosis of depression.

In a similar vein, actions may be instantiated by emotions seen as physical forces as Kövecses (2000) points out, given that they are a contributing factor within the conceptual system of metaphorical event structure. According to this view, there exists a causal relationship between emotion and action response, i.e. an internally generated force of an emotion acts on an individual or propels that individual to act. Among the ABI group an example is, "*I am trying to push myself*", and "*they nudge you in the right direction*" in which the struggle to motivate relates the lack of movement in a negative manner. The source for the motivation to recover may be internal (i.e. oneself) or external (i.e. rehabilitation support), as are the forces which drive the emotions themselves. This particular image schema typically structures our conceptual system regarding emotions in general but is it less known how these are precisely mapped. In the case of participants with ABI, a clear inverse relationship within the data is shown to occur where greater

frequency of action metaphor is associated with lower valence scores, overall, particularly prominent in the current temporal domain. Upon cross-examining conceptual metaphor theory and emotional data provide a window into how one reconceptualises their actions in life, being the second most common image schema documented throughout all narratives.

4.4 Limitations

The study had some unavoidable limitations which pertain to methodological obstacles encountered. It should be noted that among ABI participants, memory and other cognitive functions could be impacted following the trauma. Their reflections of traumatic events which require recall of the past and predictions of the future hinge upon neural pathways often implicated in physical trauma to the brain. Most prevalent effects of trauma have been shown to impair facets of memory, which contribute to fluctuations in mood and emotional behaviour (Bhalerao et al., 2013) with post traumatic effects impeding autobiographical memory (Crespo & Fernández-Lansac, 2016). As such, it was not possible, given the current access to resources available through the rehabilitation clinic, to obtain details regarding these possible affected neural regions. Therefore, the data requires a more thorough screening procedure to avoid the potential of yielding inaccurate or fabricated recounts of traumatic events.

Additionally, participants recruited for the current study were predominately male (11 males, 2 females) and the study would likely benefit from counterbalancing across

genders to determine whether metaphoricity might be performed differentially across genders. A review of gender itself has been shown to indicate a very small effect size when examining PTG literature, with greater levels of PTG observed in women than in men (Grace et al., 2015). However, when examining overall incidence of ABI, it was reported to occur with greater statistical likelihood in males than females, which naturally affects equal recruitment across genders (Roebuck-Spencer & Cernich, 2014) .

Furthermore, it should be noted that metaphoricity, or lack thereof, could be driven by particular idiosyncrasies among the individuals themselves. Personality traits and functional outcomes following acquired brain injuries pose a great challenge in pinpointing whether metaphors are conventionalized for these individuals. Metaphors which are conventionalized pose the risk of being commonly used and therefore less representative of the nature and descriptive adequacy required to capture a traumatic event. As well, the overall informativeness of responses further adds to the lexical density of the narrative with some individuals less descriptive, willing, or able to recall traumatic events. An added factor to consider is the possible risk-taking behaviours and impairments in self-awareness among ABIs and the effect this has in participant involvement. Self-awareness (i.e. the ability to accurately perceive effects of their disorder on physical, cognitive, and behavioural abilities) is often impaired and affects risk-taking behaviours. As a result, the study methods which examine metaphor may also be impacted by affecting who participates, and their ability to reflect meaningfully about their disorders due to ABI (Sherer & Fleming, 2014).

In addition, post-traumatic growth and recovery could not be directly measured in the current study and so we had to utilize the measures taken from previous experimental and cognitive linguistic approaches. In doing so, this study extends the established measures collected from similar studies that looked at emotion, recovery, and post traumatic growth which may follow. Recognizing positive changes across time despite negative life circumstances is the cornerstone of PTG and was observed in the data collected. Despite using careful techniques to examine the data, larger data set and standardized measures are required to gauge growth according to statistical models developed for participant data in this study. Previous research has examined positive life changes and outlook following trauma to exist along a continuum.

4.5 Implications for a model of recovery in ABI

The study presented in this thesis was conducted based on previous methods of emotional analyses among ABIs, and psychological trauma sufferers. Using relatively novel approaches of examining metaphorical language in trauma narratives provides a fairly reliable estimate of ABI emotional outcomes. Combining this with representative emotional and concreteness data adds further strength to much of the metaphorical event structure observed within recounts of trauma. While conceptual metaphor theory provides many pertinent explanations for the commonly used linguistic strategies documented in trauma narratives, a detailed investigation of emotional valence and concreteness reveal further validation for the data collected.

The current study attempted to derive empirical and cognitive linguistic substrates which comprise trauma as a means to understand emotional changes in perception following an acquired brain injury. As such, the current model, using well attested demographic data, may provide a fairly robust marker for possible assessment of the mechanisms of recovery. A cross-examination of previous research on pragmatic and linguistic patterns characteristic of traumatized individuals yields similar results for narrative data. However, the current study provides evidence that metaphor could be reflective of increasingly evocative accounts of the experiences following a traumatic event. Taken together, metaphor provides a fairly reliable marker to represent emotions and index where one might be positioned along the spectrum of psychological recovery.

Since physical recovery varies according to a plethora of factors, emotion and metaphor may be able to contribute a potential index for post traumatic growth. The patterns systematically demonstrate enhanced positive emotional outlook irrespective of potentially delimiting clinical factors among those with depression. The current study contributes to an understanding of metaphor with an increased emphasis on emotional representations. Exploring the impact this has in trauma may help bridge the gap between pure emotion processing deficits following ABI and analyses of metaphorical expressions extracted from trauma narratives. The data suggest the possibility to use a particular distribution of specific metaphorical information to map predictive outcomes which can inform current diagnostic tools for assessing emotional issues following an ABI. The non-standard approaches used to assess emotional outcomes merit further investigation to

validate their utility in the broader scope of traditional therapy such as cognitive behavioural therapy and psychoanalytical measures.

4.6 Future directions

There are many questions that the current study helped to identify. For example, subsequent research in the domain of emotional valence should address the relationship between the neurological region affected by a traumatic event and use of figurative language in narrative. In addition to the established demographic variables associated with TBI, including the added specificity of site of damage in the brain could further disentangle hemispheric effects associated with emotional processing (Sherratt, 2007). Given that handedness and hemispherical dominance are interrelated and that they influence emotional processing (Dimancescu, 2008) and figurative language interpretation (Kasparian, 2013), it could be inferred that a consequent alteration in emotional expressiveness in metaphorical constructions could be partially influenced by the participant's dominant hand. Testing cognitive functions directly, alongside neuropsychological tests of emotion would further validate the findings derived in research areas of emotional processing. The neurological underpinnings associated with trauma reflected in figurative language merits further investigation to shed light on the emotional impact it entails.

Subsequent research should also note the possible influence of bilingualism on conceptualization of metaphorical expressions and study whether alternating between

languages impacts overall emotional status. A careful examination of bilingual influences with regard to conceptual metaphor suggests differences in the temporal and spatial relationships described. According to Falk (2012), cross-linguistic transfer between first and second language was shown to produce several important differences as one's native language shapes specific metaphor choices and affects how experiences are expressed in a second language. This is particularly important as several participants in the current study were bilingual; even though English was their dominant language, it was not necessarily their first language acquired.

5.0 Conclusions

By examining the emotional connotations of words in metaphorical expressions in the context of interviews with persons with ABI, the present study was able to transcend some barriers observed in traditional examinations of figurative language in trauma narratives. Specifically, the use of emotional valence signaled a promising area of exploration suggesting clear differences in framing emotions across time post injury. Together with concreteness, the emotional valence plays a significant role in establishing how meaning is conveyed, highlighting how metaphor can illuminate conceptualizations of subjective progress throughout the journey towards recovery.

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Appendix

A: Total participant demographic information, clinical information, and ABI details

Participant	DSM Diagnosis	Injury Classification	Age	Education	Time Post Injury
RB	—	Aneurysm	33	10	21
GR	—	Fall	26	12	10
GH	Depression	MVA	45	15	25
VB	—	MVA	41	10	20
PT	—	MVA	48	13	25
AB	—	Assault	33	10	13
JS	—	Hit by train	49	10	39
MK	Depression	MVA	57	13	38
GL	Depression	Brain Tumour	53	15	17
BT	—	Brain Tumour	49	14	24
SL	Depression, Personality Disorder	Hemorrhage	43	15	6
TS	Delusional Disorder	Gun Shot	42	8	20
RD	Tourettes	Assault	40	13	37

B: Interview questions

1) How would you describe your life before your incident? Use any means to best describe this.

2) Tell me about a particularly important memory you had in the past; either positive or negative and how would you describe it?

3) What do you feel was the most challenging aspect of life before your incident?

4) In what way has this incident affected your life?

5) How would you describe your life now?

6) What are the personal goals you have presently? Things you may want to achieve through rehabilitation?

7) How do you feel about the future?

8) Where do you see yourself in 1 year from now. 5 years from now? 10 years from now?

9) Is there anything you can think of that is a positive outcome from this incident?

10) What do you feel is the hardest part about your situation?

11) What is the most difficult thing for you to explain to others?

12) Is there anything you would like to say to others in a similar situation?