Knowledge and experience of in-service, secondary and post-secondary teachers on mild traumatic brain injuries: Return to learning in the classroom

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I hereby declare that I am the sole author of this thesis. This is a true copy of the thesis, including any required final revisions, as accepted by my examiners.

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ABSTRACT

Mild traumatic brain injuries (mTBI) are becoming more prevalent in adolescents. As these injuries can occur during the school year, returning to school and learning can prove to be difficult for some individuals. As each mTBI affects individuals differently, teachers need to be prepared to use a variety of different strategies and have sufficient knowledge of both the injury and accommodations/strategies to assist the student in returning to learn. I examined what knowledge, strategies, experience, and training in-service, secondary and post-secondary teachers have pertaining to the issue of mild traumatic brain injuries and returning to learning. An online survey was used to collect data responses related to mTBI, symptoms, strategies, etc., to see what teachers knew and what they want to know more about pertaining to the issue of mTBIs. The results from this study showed that current secondary and post-secondary teachers have some, but not extensive knowledge, and fewer than expected educators have received training in the area of mTBIs. These findings suggest that there are knowledge gaps in both mild traumatic injuries themselves and working with them, and that to fill these gaps and instill confidence in educators assisting students post mTBI, mandatory training should be implemented.

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Chapter One: Introduction and Literature Review

We are always learning (Sternberg, 1997). Because learning develops and occurs throughout one's lifetime, there are ample opportunities for something to occur and disrupt the process. A mild traumatic brain injury (mTBI), more commonly known as a concussion, or sometimes as traumatic brain injuries (TBIs), can be one of those disruptions, affecting not only an individual's learning process but other cognitive and social functions as well (Rosema, Crowe, & Anderson, 2012). The term concussion, a well-known term in the sports world, is becoming better known and understood in everyday life over its sister terms mild traumatic brain injury and traumatic brain injury (King, Brughelli, Hume, & Gissane, 2014). The terms concussion and mild traumatic brain injury can be used interchangeably, and in regards to classifications of traumatic brain injuries, concussions fall into or just marginally below the mild category (King et al., 2014). In this thesis the term used will be mild traumatic brain injury.

Mild traumatic brain injuries are becoming more and more prevalent in today's society and are appearing in an array of different ages. In the United States, there are an estimated 1.4 million traumatic brain injuries each year (Langlois, Rutland-Brown, & Wald, 2006), and 100, 000 in Canada (Hachem, Kourtis, Mylabathula, & Tator, 2016). A survey administered to a University located in Midwestern United States by Krause and Richards (2014), showed that, of the undergraduate students surveyed, 16% of them had suffered a TBI and reported experiencing symptoms that could affect their academics. Although there is no universally agreed upon number, it has been shown that females endure a greater number of mTBIs, sustain more symptoms in numbers and severity, as well as take a longer period of time to fully recover when compared to males (King et al., 2014). With a large number of mTBIs in adolescents occurring each year there are a large number of students that have to return to the classroom while still

recovering from such an injury (Gessel et al., 2007). Adolescents have a higher prevalence of sustaining mTBIs (Baillargeon, Lassonde, Leclerc, & Ellemberg, 2012), due to the number of student athletes who participate in sports and other activities involving contact (e.g. hockey, football) (Hachem et al., 2016).

Current research is focused on what effect mTBIs have on learning processes such as executive function, attention, and social function as well as which strategies are best for assisting students to get back into the learning environment (e.g. Levin & Hanten, 2005; Rosema, Crowe, & Anderson, 2012; Master, Gioia, Leddy, & Grady, 2012; McAvoy, 2012). What remains unclear, however, is whether educational professionals have the knowledge to understand the impacts of mild traumatic brain injuries, and what strategies may be used for assisting students in returning to learn. As a post secondary student, I myself have sustained concussions and gone through the return to learning process in a university setting. In both of my personal experiences it was evident that my professors did not all have the same understanding of the injury and the repercussions. In some cases assignments were extended and tests were moved to later dates but in other circumstances I was told I had to complete my assessments with the rest of the class even though I had a note from a physician. This proved to not only be frustrating for me, but to my professors who did not fully comprehend the injury and the impacts it had on me and my ability to learn and succeed in the academic setting. Going through the experience made me wonder whether educational professionals have the knowledge to understand the effects of mTBIs and the possible strategies that can be used to assist students like myself in returning to learn. The proposed study aims to address this question by examining educational professionals' knowledge of TBIs and perception of their ability to work with mTBIs in the classroom.

What is a Mild Traumatic Brain Injury and What are the Effects

What is a mild traumatic brain injury? The term getting one's 'bell rung' or getting 'knocked out' all fall under the category of acquiring a mTBI. The Centers for Disease Control and Prevention (CDC), (2015) describes traumatic brain injuries as a silent epidemic, because the detrimental effects that occur after a mTBI can develop without any warning (Howell, Osternig, Van Donkelaar, Mayr, & Chou, 2013). They are defined as an injury, usually caused by a blow or trauma to the head, that affects the brain and results in a brief loss and alteration of normal brain function and/or mental status (American Association of Neurological Surgeons [AANS], 2015).

When an individual is hit on the head, or one's body is suddenly stopped but their head keeps moving, (e.g. during whiplash), the motion or impact causes the brain to collide with one side of the skull, and then as the body realigns after impact, the brain strikes the opposite side of the skull (Gaetz, 2004). These acceleration and deceleration forces are both important factors in a concussion, but the production of rotational acceleration forces (i.e. when the head twists, even slightly, in response to motion or impact) are the key cause of mTBIs and are especially important in being able to predict brain damage (Gaetz, 2004). When the brain endures these acceleration, deceleration, and/or rotational forces, nerve fibres can stretch and tear causing damage to the nerve fibres and axons (Gaetz, 2004).

The Ommaya-Gennarelli model of traumatic brain injuries, suggests that the acceleration and deceleration forces that occur when the head is moving and then suddenly stopped cause a centripetal sequence that induces the mechanical strain (Gaetz, 2004). This centripetal sequence begins at the surface of the brain and then gradually moves deeper into the structures of the brain as the force and injury become more severe (Gaetz, 2004). To categorize the progressiveness, a

system of grading was created that ranges from minor to severe disruptions of consciousness (Gaetz, 2004). The classifications range from grade I, which includes cortical-subcortical disconnection, to grade V, which involves cortical-subcortical, diencephalic, and mesencephalic disconnection (Gaetz, 2004). The Ommaya-Gennarelli model also supports three different principles that examine how acceleration and deceleration forces affect the brain and how traumatic brain injuries occur (Gaetz, 2004). The model's first principle is that the severity of the brain injury and recovery time is correlated with the directional force applied, with rotational forces causing more severe injuries (Gaetz, 2004). Sagittal (front-to-back) injuries result in a better recovery compared to lateral (side-to-side) injuries, which can result in a severe disability or even coma, while oblique directional injuries fall between the former listed directions (Gaetz, 2004). The second principle of the model is that brain injuries range from the brain's surface and penetrate deeper into the brain with each level corresponding to an increase of damage (Gaetz, 2004). The final principle is that for a traumatic brain injury to occur, there does not have to be direct trauma to the head, as acceleration and deceleration forces alone are enough (Gaetz, 2004). Because symptoms and effects of mTBIs vary and can occur in numerous different ways, the pathophysiology of TBIs needs to be properly understood to accurately assess, diagnose, and care for during an individual's road to recovery (Gaetz, 2004).

Symptoms. The symptoms and effects of a mTBI differ for each person and can range from minor to severe and short-term to long-term. Though majority of symptoms clear up within two weeks post injury (Zemek et al., 2016), for some, they can last for longer periods of time, and even when symptoms have cleared up, it doesn't always imply complete cognitive recovery (King et al., 2014). Symptoms that are most familiar to the public include: headache, dizziness,

nausea, and memory loss (AANS, 2015). Other symptoms that can appear are hearing and vision sensitivities, confusion, and compromised balance (ANNS, 2015).

There are also significant cognitive symptoms. Based on the Ommaya-Gennarelli model, most mTBIs will primarily affect the areas of the brain closest to the surface (Gaetz, 2004). That means that mTBIs are most likely to affect the pre-frontal cortex in the frontal lobe, an area that is responsible for much of our higher-order thinking skills and executive functions (Zappala, de Schotten, & Eslinger, 2012). The neural cells in this area are particularly vulnerable to damage caused by an mTBI while they are developing - a process that continues well into early adulthood (Baillargeon et al., 2012). This means that not only are adolescents and young adults more vulnerable to sustaining mTBIs (Baillargeon et al., 2012) but they may also be more susceptible to the symptoms, especially cognitive symptoms (Baillargeon et al., 2012).

The cognitive effects caused by sustaining a mild traumatic brain injury include decreased cognitive function and attention, trouble concentrating, difficulty learning, impaired memory, the feeling of being in a fog, or feeling slowed down, all of which can affect one's learning abilities (Sady, Vaughan, & Gioia, 2011). Memory can also be affected after sustaining a mTBI, meaning that students may have trouble recalling information immediately, or their brain may not be able to send new information to long term memory storage for future retrieval (Pershelli, 2007). An array of symptoms can develop/emerge after sustaining a mTBI, but severity of the symptoms is related to the magnitude of force put on the brain (Gaetz, 2004).

Importantly, some symptoms of mTBIs may not be observable or correctly identified by a classroom teacher. For example, a teacher cannot visibly see a student's headache or dizziness. Similarly, cognitive symptoms, such as fogginess or inattention may be misinterpreted as the student being tired, lazy, or disinterested. Cognitive symptoms may additionally impair a

student's ability to communicate, meaning that their ability to explain their symptoms may be impaired. Having a good understanding of symptoms, particularly cognitive symptoms, will allow teachers to better identify them without solely relying on student communication and can also help clear up any misinterpretations.

Academic implications. The primary impact of mTBIs on academic success is through impairments to the executive function network. Executive function is an important component of everyday life and academics (Wasserman & Wasserman, 2012) playing a role in skills such as recall and retention, suppressing information, self-managing, and attentional abilities (Levin & Hanten, 2005). The term executive function is such a broad term that there still has not been an accepted universal definition (Wasserman & Wasserman, 2012). A definition that seems to assimilate most is that executive function is an "umbrella term for a diverse set of 'higher cognitive processes,' including (but not limited to) planning, working memory, set shifting, error detection and correction" (Zelazo & Cunningham, 2007, p.136). Inhibitory responses are also included in most models of executive function (Zelazo & Cunningham, 2007). Though executive function has many roles in different daily actions and skills, it plays a major role in memory, attention, and emotion regulation – key elements for learning and academic success in both secondary and higher education (Wasserman & Wasserman, 2012; Davies, Trunk, & Kramer, 2014). In this section, I will more closely examine some elements of executive function that are both particularly vulnerable to damage from mTBIs and particularly important for academic success.

Working memory. Working memory is defined as the process used for short-term storage and management of incoming information (Levin & Hanten, 2005). Working memory is age dependent and usually continues developing and maturing through adolescence, and, though

it has limited capacity, studies show that it contributes to most academic skills (Levin & Hanten, 2005). For example, working memory has been found to have the potential to predict students' accuracy of solving word-problems (Raghubar, Barnes, & Hecht, 2010). Passolunghi and Siegel (2001) found that working memory deficits were found in individuals who had trouble with problem solving, with impairments in both numerical (mathematical) and verbal working memory tasks. After sustaining a traumatic brain injury, working memory can be impaired (Levin & Hanten, 2005) such that an individual is unable to process and retain new incoming information for immediate recall, nor organize their thoughts and new information in a logical sense (Chapman et al., 2006). Difficulties in these areas of working memory have been shown to have significant impacts on children's ability to learn and retain new information (Chapman et al., 2006), and have been connected to academic struggles in literacy, math, and general academic success (Levin & Hanten, 2005). These deficits can occur even for a mild TBI, where they can typically last up to a week (Chapman et al., 2006) and long-term, this potential impairment can last up to four years after a severe TBI (Levin & Hanten, 2005).

Inhibition. Inhibitory control is a skill that is age dependent, and can include suppressing irrelevant responses, irrelevant information retrieval, stopping an in progress response, or ability to resist distractions causing perceptual interference (Levin & Hanten, 2005). Inhibitory control plays a role in problem solving, for example, it has been found that individuals with poor inhibitory control are unable to filter out irrelevant information provided in mathematical problems (Passolunghi & Siegel, 2001). After a traumatic brain injury, inhibitory skills can be significantly impaired, particularly in the ability to ignore distractions (Levin & Hanten, 2005). Difficulties with inhibition can have significant impacts on children in all academic subjects, and

studies show that this ability can be impaired even six months post-mTBI (Levin & Hanten, 2005).

Metacognition. Metacognition includes self-assessing, self-appraisal, self-management, and/or self-monitoring of one's own cognitive processes and learning, and it is a function that emerges as early as four years of age and continues to develop into adolescence (Levin & Hanten, 2005). Metacognition is strongly correlated with both academic achievement and performance (Narang & Saini, 2013), and during adolescence it is seen to peak in growth in relation to social reasoning, propositional, and spatial tasks (Weil et al., 2013). Having a strong knowledge of cognition and regulation - the two components of metacognition - can produce skillful problem solvers, lifelong learners, and in general can promote successful learning in adolescents (Narang & Saini, 2013). Post six months of a traumatic brain injury, metacognition deficits can be seen in tasks that involve monitoring and control such as finding and repairing sentence irregularities which can affect and impair future academic performance (Levin & Hanten, 2005).

Attention. Mild traumatic brain injuries also have negative, short, and long-term effects on attention (Yeates et al., 2005). The external environment is always displaying more information that can be processed effectively, but attentional mechanisms have developed the ability to focus on the more imperative information even with a limited processing capacity (Chun, Golomb, & Turk-Browne, 2011). This occurs through the two defining parameters of attention: selection and capacity.

For selection, attention is a process of choosing what information is applicable to an individuals target objective (Chun et al., 2011). Attention can further be broken down into several specific categories: external and internal attention, attentional effort, and selective

attention. External attention is focusing on the effect of one's actions or response to stimuli or perceptual information that is received through one of the five senses and has a direct impact on processing received information pertinent to the sensory cortical regions (Chun et al., 2011). Unlike external information, selection for internal attention is done internally and defined as focusing more on using cognitive processes to focus on the details of one's actions and their internal mental life (Chun et al., 2011).

For capacity, because individuals are surrounded by and attend to different stimuli each minute of the day, they are not able to encode everything, so long-term memory works closely with internal attention to help determine which information gets stored long-term and how it will be retrieved in the future (Chun et al., 2011). Similarly, working memory works closely with both external and internal attention, and because of its lower capacity it limits the amount of information that can be manipulated and encoded (Chun et al., 2011).

According to Levin and Hanten (2005) symptoms related to difficulty with attention such as impulsivity, restlessness, and inattentiveness can be a consequence of traumatic brain injuries. Other attentional symptoms include excessive talking, difficulty keeping attention, and getting distracted easily (Levin et al., 2007). Additionally, there is some evidence that children who experience TBIs, primarily severe TBIs, may develop secondary or acquired attention-deficit hyperactivity disorder (SADHD) (Levin & Hanten, 2005). A study conducted by Levin et al. (2007) reported that SADHD was seen in 19.2% of children who had previously suffered a traumatic brain injury (mild to severe) but who did not have pre-injury ADHD. Interestingly, children who sustain a traumatic brain injury but do not display attentional problems pre-injury, have a greater chance of exhibiting SADHD compared to those who do have pre-injury attentional problems (Yeates et al., 2005).

For individuals without attentional problems pre-injury, the number and severity of ADHD symptoms are directly related to severity of injury, whereas for individuals with pre-injury ADHD, symptoms have no correlation with injury severity at all (Levin et al., 2007). Regardless of whether an individual has diagnosed attention difficulties either before or after injury, any attentional deficits post-injury can cause difficulties throughout the learning process. The previously listed symptoms are commonly seen in children who have suffered a moderate to severe traumatic brain injury and can potentially hinder psychosocial development as well as academic achievement (Levin et al., 2007).

Executive function, more specifically its subcomponents listed above (working memory, inhibition, metacognition, attention), are closely linked to performance and abilities in a school setting (Checa & Rueda, 2011). These factors have the potential to predict academic achievement and an individual's social adjustment in a classroom (Rueda, Checa, & Rothbart, 2010). They are also often particularly affected by mTBIs, with effects lasting for weeks or years. Understanding how mTBIs can impact executive function can potentially lead to better-tailored research and assessment for post mTBI academic success in forthcoming years.

Social and emotional effects. Damage to the pre-frontal cortex does not only affect academic success directly, as with the repercussions on everyday cognitive difficulties outlined above, there is also an indirect effect on academics through social implications (Rosema et al., 2012). Research in the past few decades has shown that social skills are correlated with neurological and cognitive function (Rosema et al., 2012). Because social network pathways are located in the same pre-frontal areas as the executive function skills outlined above, they also develop and mature throughout adolescence and young adulthood (Rosema et al., 2012). Therefore, suffering an mTBI during this time can lead to social difficulties (Rosema et al.,

2012). Individuals who have suffered a mild traumatic brain injury are more likely to perceive themselves as being lonelier and less socially competent as well having poorer interpersonal relationships and adaptive behaviours (Ganesalingam, Yeates, Sanson, & Anderson, 2007).

Social adjustment. Social adjustment is defined as an individual's ability to be able to adapt to the different demands of their social environment, their ability to get along with peers, and the level one engages in competent behaviour and disengages incompetent behaviour (Rosema et al., 2012). After sustaining a traumatic brain injury parents report that their children's socialization and communication skills are impaired (Rosema et al., 2012). Individuals who have sustained a mTBI have had lower scores on self-esteem and adaptive behaviour while having higher scores on antisocial, maladaptive, and aggressive behaviour, as well as loneliness (Rosema et al., 2012).

Social interactions. Social interaction includes an individual's or group's actions and/or reactions related and tailored to different social situations (Rosema et al., 2012). Children with mTBIs reported that they had fewer close friends and injury severity was linked to the number of close friendships they would have, with the more severe TBI individuals having fewer close friendships than those with a moderate or mild TBI (Rosema et al., 2012).

Social cognition and problem solving. Social cognition is the mental process used to perceive and process stimuli in one's environment, and the social cues around them (Rosema et al., 2012). In a study by Hanten and associates (2008), it was found that children who have sustained a traumatic brain injury had significantly lower scores in social problem solving when compared to a control group (Rosema et al., 2012). It was also seen in a different study by Janusz and associates (2002) that along with having lower scores, children with a mTBI had the ability to produce solutions to social problems but were less likely to choose solutions including

peers (Rosema et al., 2012). They are also more likely to use more simple reasoning, which generates solutions and strategies that are more immature (Ganesalingam et al., 2007). When provided hypothetical situations that involved social problems, children with mTBIs offered more aggressive and avoidant solutions compared to those without a mTBI (Ganesalingam et al., 2007).

Overall, individuals who have suffered a traumatic brain injury, including a mild traumatic brain injury, are at an elevated risk for having impaired social functions in a variety of different areas, and, because of this, researchers suggest that assessments of TBIs should include social function tasks to ensure all capacities are being assessed and to help in reintroducing a classroom setting during the recovery process (Ganesalingam et al., 2007; Rosema et al., 2012).

Emotional regulation. There are also significant emotional impacts to mild traumatic brain injuries. Executive function plays a role in emotional regulation in planning and inhibiting responses, as well as controlling where one's attention is focused which can influence an individual's capability of controlling behaviours when dealing with different social demands (Riggs, Jahromi, Razza, Dillworth-Bart, & Mueller, 2006). The recovery and return-to-learning process has been shown to cause stress, anxiety, and frustration, which may exacerbate other symptoms (Sady et al., 2011). Frustration, irritability, and sleep deprivation (directly related to irritability and frustration) are some of the symptoms that last the longest for individuals (Eisenberg, Meehan, & Mannix, 2014). Of these individuals, 18 percent stated that their academic performance had been negatively affected while roughly thirty-four percent had not attended school at all after their injury (Eisenberg et al., 2014).

Depression. Learning can also be burdened due to post mild traumatic brain injury depression that can develop either from the injury itself, or as a byproduct of the other emotional

symptoms (Chrisman & Richardson, 2014). Having a history of mTBIs is correlated with a 3.2-fold larger risk for developing depression compared to individuals who have never had one (Chrisman & Richardson, 2014). Learning is greatly affected by depression because it can impair one's cognitive functioning, decrease brain functioning speed, cause a lack of desire to want to learn, and may include any of the previous listed physical, cognitive, or emotional symptoms brought on by mTBIs (Chrisman & Richardson, 2014) which affect an individual's learning dramatically.

Academic connections. In sum, mild traumatic brain injuries affect an individual's cognitive, attentional, social, and emotional networks. Difficulties with attention and other executive function skills can make it harder to focus, recall, and learn new material in class (Halstead et al., 2013). This can be difficult for classroom teachers, because if a student is having trouble in class remembering old or learning new content, it can become frustrating to both student and teacher, making matters worse (Savage, Depompei, Tyler, & Lash, 2005). It can also be frustrating for both student and teacher when a student in the classroom is having difficulty focusing throughout the whole day (Savage et al., 2005). The student may be trying hard and wanting to focus but their injury may be restricting them to do so, and for a teacher, it may pose difficulties in the class if it distracts other students (Savage et al., 2005). Similarly, difficulties with social and emotional functioning post-mTBI can have significant impacts on students' well-being and relationships in the classroom (Ganesalingam, Yeates, Sanson, & Anderson, 2007). A student's well being in the classroom can impact their ability to interact with their teacher(s) and peers, which can impact their success rate and general academic well-being (Ganesalingam et al., 2007).

Furthermore, if an individual returns to learning too early during the recovery period, it can lead to worsening their symptoms – including those cognitive, attentional, social and emotional symptoms – and/or prolong their recovery (Halstead et al., 2013). Teachers need to be aware of these implications so that they do not exacerbate a student's symptoms in the classroom environment, therefore slowing their recovery or even causing additional damage (Halstead et al., 2013). For example, classroom features like bright lighting, loud noises, or crowded areas may worsen difficulties with attention and other executive function skills (Halstead et al., 2013). An individual who has any kind of light or noise sensitivities will have difficulty in a classroom as SMART boards, computers, artificial lighting, slide projectors, hallways, physical education classes, and common areas such as the cafeteria can trigger and worsen those symptoms (Halstead et al., 2013).

Although most impairments caused by mTBIs are recoverable, if care is not taken by classroom teachers (along with parents, doctors and other caregivers) to avoid aggravating the injury, there can be significant academic setbacks (Anderson, Brown, Newitt, & Hoile, 2009). If a student is unable to keep up with their schooling because of cognitive or social effects of mTBIs, then they may need to drop classes or entire semesters to allow for proper recovery and so their overall grades do not become affected (McGrath, 2010). Similarly, students who have suffered from mTBIs are at a significant risk for dropping out of the education system altogether. Individuals who have had a traumatic brain injury are actually "3 times less likely to complete high school and 2.3 times less likely to obtain a university degree" (Anderson et al., 2009, p.310), or overall less likely to attend a post-secondary institution (Krause & Richards, 2014). Along with this, individuals who have suffered a severe TBI are more likely to require additional

assistance throughout their schooling or be placed in a special classroom to meet their needs, and with this are more likely to achieve lower levels of education (Anderson et al., 2009).

Not only does the potential impairment of executive function from mTBIs directly affect academic success, but it also can potentially affect a student's transition from secondary to post-secondary schooling (Davies et al., 2014). Because the transition from high school to a post-secondary institution is crucial for students in settling into their new environments, having any cognitive, social, or behavioural impairments due to mTBIs can potentially hinder that transitional process (Davies et al., 2014).

There are many undesirable effects related to sustaining an mTBI so individuals need to be aware that their learning can be negatively affected making their learning process more difficult. Health care professionals and educators should also be aware of all of these difficulties so that they can work with students and individuals exercising strategies to ensure that they still reach their educational potential and do not become a drop out risk.

Strategies for Returning to Learning

Existing models and steps to take. The process of returning to learn can take days to months depending on the individual, their history of mild traumatic brain injuries and, the severity of the injury. The process involves a number of people other than the affected individual, including their parents/guardians, friends, teachers, school administration, school psychologists, nurses, and/or guidance counselors (McGrath, 2010). For injuries occurring during sports, "Return to Play" plans are used widely across North America in a variety of levels of educational systems. Return to Play is a set of guidelines used by educators, physicians, and coaches alike in assisting athletes in returning to their sport after sustaining a concussion (Echemendia, Giza, & Kutcher, 2015). There are generally six steps, and progression to next

steps can only be reached once an individual reports no symptoms for the step they are currently on (Echemendia, Giza, & Kutcher, 2015; Parachute Canada, 2014). The steps include: no activity or limited symptom activity, light aerobic exercise, sport specific activities, non-contact drills, full contact practice (once cleared by a physician), and return to full play (Echemendia, Giza, & Kutcher, 2015; Parachute Canada, 2014). However, return to learn plans have not been given as much attention (Master et al., 2012). In a return to learning plan, the first step is cognitive and physical rest, meaning no school, work, time on the computer, reading, and sometimes no television (Master et al., 2012). After the symptoms have subsided, the next step is a controlled reintroduction to cognitive activities at a gradual pace to ensure that the symptom threshold level is not surpassed (Master et al., 2012). Surpassing the threshold level typically exacerbates their symptoms, which will prolong an individual's recovery time. This occurs fairly easily, however, because when symptoms start to subside, individuals get a false sense that they have recovered and can start tackling activities at full cognitive force (Master et al., 2012). A step that is commonly skipped is completing schoolwork at home before attending school in order to gradually start doing work at one's own pace without the extra distractions (Master et al., 2012). Because this whole process can take a varying amount of time, the key to a successful, full, recovery is to have patience and a strong, understanding support team at home and at school.

Strategies to use in the classroom. There are many strategies that are used by educators and professionals to help foster the learning process, but these strategies may need to be altered to support students who have sustained a mTBI. In particular, because the classroom environment poses risks both to physical recovery and academic achievement, teachers need to be able to both minimize cognitive exertion, and support impaired learning. There is no current

research that exists pertaining to predominant strategies being used today by educators or which strategies demonstrate to be most effective.

Visual. The aftermath of a mTBI can cause vision impairments such as blurred vision or more commonly, sensitivity to light. To help alleviate these symptoms in the learning environment educators can provide the student with larger font for handouts, overheads, when using the SMART Board, or the student can be given permission to wear sunglasses in class to prevent the artificial ceiling light from bothering them (McAvoy, 2012). Turning off overhead lights during the day if they are not required and reducing the brightness on computers and tablets if used in the classroom is also recommended (Halstead et al., 2013).

Auditory. Relieving noise sensitivity can be harder to do since classrooms and schools are full of students at all times. A couple of strategies educators can use in classrooms include allowing the student to sit in an empty room while completing independent work or assessments, and allowing students to wear ear plugs or noise cancelling headphones (Smith & Riccomini, 2013; Bowen, 2005). Teachers can also have the individual leave class earlier, allowing them to get to their next class without experiencing the noisy hallways and have them excused from music, shop, or gym class to avoid the echoes and loud noises (Halstead et al., 2013).

Preventing cognitive exertion. To prevent cognitive overload and exertion from occurring, there are several strategies which can ease the burden on executive function skills. Halstead et al. (2013) suggest shortening the day into thirty to forty-five minute intervals or attending class for the thirty minutes and then taking a fifteen-minute rest period. Along the same lines, breaking learning, assignments, or classroom tasks into smaller steps will make it easier for an individual to complete the task without overexerting or becoming frustrated (Bowen, 2005). Permitting a student to use computer-assisted or audio-assisted programs can

also help in the recovery process. Since listening and being able to take notes may be difficult to do at the same time, assigning the affected student a note taker may also help and promote recovery (McGrath, 2010). Extending deadlines, staggering tests (McGrath, 2010), giving students extra time or postponing tests and exams map help to alleviate any extra-added stress that can lead to triggering cognitive symptoms such as headaches and difficulty concentrating (Halstead et al., 2013).

Supporting retention of new information. Students who have suffered concussions may not realize that their ability to retain new information in long-term memory has become potentially impaired until they have already returned back to learning (Pershelli, 2007). According to Pershelli (2007), there are three main types of strategies to improve the retention of new information: lock-in memory strategies which help maintain retention of information, recall memory strategies which assist with retrieval of information, and ease of burden memory strategies which function as artificial memory. Within lock-in, there are three specific strategies: rehearsal strategies, grouping strategies, and association strategies (Pershelli, 2007). Rehearsal strategies help short-term retention and involve repeating information aloud over and over, grouping strategies involve grouping information into smaller groups to assist in memory, and association strategies include matching words with familiar pictures helping to recall new information (Pershelli, 2007). Recall memory strategies include visualization where the student pictures the content to help remember the information (Pershelli, 2007). Ease of burden memory strategies are used for students whose recall memory is almost completely impaired (Pershelli, 2007). An example is using computer software programs that organize data and information inputted by the student by chunking and colour coding it (Pershelli, 2007).

No mTBI is the same and each recovery period varies individual to individual. Some strategies will work better for certain individuals than others, but the best way to help a student return to learning during their recovery process is to ease them back in and to keep a gradual pace to avoid increasing cognitive demands.

The teacher's perspective. Although a great deal of research details the effects of mild traumatic brain injuries on learning it is unclear how much teachers know about the implications and strategies associated with returning to learn post-mTBI. To my knowledge there is no research pertaining to teachers' perspectives and/or level of understanding of mTBIs. The Ontario Ministry of Education took action in developing the Ontario Policy/Program Memorandum on Concussions in March 2014 (Hachem et al., 2016). With this policy, Ontario school boards were administered resources as well as a minimum standard concussion protocol to assist boards in manufacturing and implementing their own concussion policies by January 30th, 2015. However, it is unknown how many schools have actually implemented these policies (Hachem et al., 2016). Many educators perceive traumatic brain injuries as low occurrence disabilities compared to other disabilities (Bullock, Gable, & Mohr, 2005), and in a study by Mohr and Bullock (2005), only half of them had actually received training either from their school board or from a previous undergraduate teacher college course. However, 71% of this group of educators believed that it was very important to have some extent of teacher college courses dedicated towards brain injuries so they could feel more prepared if they needed to work with a student with or recovering from a TBI (Mohr & Bullock, 2005).

By contrast, institutes of higher education have no policy requirement for training in mTBIs in the classroom. According to Marshall et al. (2015), previous guidelines focused on cognitive management strategies developed for primary and secondary students could not be

applied to post-secondary students because of the vast differences in accommodations and academic environment. Because of the differences, proposed changes were made in an updated guideline to assist current and entering post-secondary students who had currently or previously sustained a mTBI in returning back to school (Marshall et al., 2015). An analysis of ten current university level special education textbooks, revealed that the topic of traumatic brain injuries was discussed so little, that an average of 9.8 pages out of the 500 of the textbook discussed the topic of TBIs (Ettel, Glang, Todis, & Davies, 2016).

It is fundamental that educational professionals have knowledge regarding the basic nature of traumatic brain injuries, including how the deficits are pertinent in an educational setting (Bullock et al., 2005). Currently there is very little research on what teachers know about mTBIs and what they should do to assist students in a classroom setting. Adolescents and young adults in high school and post-secondary institutions are more susceptible to sustaining mild traumatic brain injuries (Baillargeon et al., 2012). The frontal lobe is completing its final stage of maturation during adolescence, therefore increasing the chance of susceptibility (Baillargeon et al., 2012). High school sports and extracurricular intramural activities are also played with more contact during these years, putting their participants at a higher risk of sustaining a mTBI. However, some teachers may not have a clear understanding of what exactly a mTBI is, or what strategies may be beneficial in returning to learn. Along with this, it is important that educators are aware of the cognitive, social, and emotional consequences that can affect an individual's academic performance (Bullock et al., 2005).

The goal of the current study, therefore, was to examine what knowledge in- service secondary and post-secondary teachers have regarding the nature and educational impacts of traumatic brain injuries. To that end, I addressed the following questions:

1) What is the current knowledge of symptoms and learning impacts of current high school and post-secondary teachers about mild traumatic brain injuries?
2) What experience do current high school and post-secondary teachers report with mild traumatic brain injuries in the classroom?
3) What strategies for returning to learn post-mTBI are current high school and post-secondary teachers familiar with?
4) Are current high school and post-secondary teachers aware of any information regarding mTBI protocol, or if given the option, would they like to learn this information?
5) How does one's level of teaching, mTBI training, and experience with mTBIs in the classroom impact one's perceived knowledge?

To address these questions, participants answered a survey addressing their current knowledge and experiences related to these issues.

Chapter Two: Methodology

A quantitative research approach was taken to address the research questions, as the current study is looking at current in-service I/S and post-secondary teachers' knowledge, what they report in regards to experiences, and what strategies they are familiar with on a broader scale (Yilmaz, 2013). Advantages of an online survey/questionnaire are that they have the ability to collect large amounts of data in a limited time, they provide access to large numbers of participants, and their very low cost (Ilieva, Baron, & Healey, 2002).

Participants

This current study's recruitment for potential participants was in Ontario. The inclusion criteria to be a potential participant was, i) currently an in-service teacher, ii) currently working at a secondary school or post-secondary institution, and iii) English speaking. Potential participants were recruited via snowball sampling (Palinkas et al., 2015), by contacting the Education Officers for certain School boards (Lakehead District School Board), contacting the Superintendent for the Thunder Bay Catholic District School Board, as well as contacting the Director of Education (Thunder Bay Catholic District School Board and Keewatin-Patricia District School board) for permission to either contact schools directly or have them refer the recruitment email. Potential participants were also contacted via contacting the Chairs or head of departments at Lakehead University, Thunder Bay campus. Recruitment emails were sent to departments that were involved in either health studies, educational studies, and/or the social sciences. Along with that, two departments were chosen as I hoped they would have a higher response rate due to the size and affiliation with the faculty of education, and the study being a quantitative study . These departments included: Education, Kinesiology, Health Science, Biology, Psychology, Women's Studies, Sociology, Math, and Music. In all cases, the potential

participants were contacted via email, inviting them to take part in this study. Participants who agreed to participate provided electronic informed consent when they clicked on the link to the online survey. There were 20 participants who participated in the study.

Table 1

Demographics

Sex	n
Male	9
Female	11
Age (years)	
<25	2
25-49	11
50-69	7
>69	-
Ethnicity	
Caucasian	20
Level of teaching	
Secondary teacher	11
Post secondary teacher	9
Years of teaching (years)	
<1	
1-2	6
3-5	2
>5	12
Highest level of education	
Undergraduate degree	7
Masters degree	8
Doctorate degree	5

Measures

The participants' knowledge and experience of and with mTBIs was recorded with a 48-item questionnaire (see Appendix A), and took approximately twelve minutes to complete. The questionnaire was anonymous and was administered online using Survey Monkey. The questionnaire assessed the participants' knowledge of symptoms, knowledge of effects of mTBIs, their experiences working with mTBIs, familiarity of strategies/accommodations,

training experience and awareness of information provided in their workplaces, and if certain teaching characteristics impact one's perceived knowledge.

Knowledge of symptoms. Question 2 and Question 3 addressed knowledge of symptoms by asking participants which symptoms they thought occurred from a mTBI and how long they thought they could last for. For each question, participants responded on a likert scale. For question 2, responses ranged from "very unlikely" to "very likely", and for question 3, responses ranged from "1-3 days" to "up to 1 year or more".

Knowledge of effects. Questions 4-25 addressed the effects of mTBIs. Responses to each question ranged from 'strongly disagree' (scored at 1 point) to 'strongly agree' w (scored at 4 points). One statement was reverse coded (see Appendix for full list of questions). Each question was classified as addressing one of 5 types of effects: Physical (one question), Emotional (three questions), Social (five questions), Cognitive (nine questions), and Academic (four questions). The average of each of the sections was taken to explore how familiar teachers were with the different effects a concussion can have physically, emotionally, socially, cognitively, and academically.

Experiences of working with mTBIs. Questions 26 to 29 addressed participants' experiences working with mild traumatic brain injuries by asking participants if they had ever worked with a student who had had a mTBI, what their emotional experience was, and the perceived usefulness of using accommodations/strategies in their classroom.

Familiarity of different strategies/accommodations. In order to examine the strategies that teachers were familiar with, independent of their prior experience, I asked three scenario questions in which participants were asked to read the scenario and then choose which

accommodations/strategies they would personally use to assist the student in the scenario. This was addressed by Questions 30, 31, and 32.

Training experience and awareness of information. Questions 33 to Question 40 addressed any prior mTBI training participants may have had, whether they were aware of any information that is provided in their schools, and if participants want to have supplementary mTBI information provided. These were addressed by asking questions that included inquiring if participants had ever partaken in mTBI training, what type of training it was, if they were aware of access to information regarding mTBIs in their schools, and what they would like to know more about regarding mTBIs.

The impact of certain characteristics on one's perceived knowledge of mTBIs. This question was addressed by asking participants to rate their perceived knowledge about mTBIs, which was addressed in Question 1. The following characteristics: participants' level of teaching (secondary or post-secondary), experience of mTBI training, and experience with mTBIs in the classroom, were then compared with the scores of participants' perceived knowledge to examine if there were any impacts.

Demographic information was also included in the set questionnaires and was addressed in Questions 41 inclusive to 48 (see Table 1 for full demographics).

Procedure

Recruitment emails that included an information letter were sent out the potential participants. Once participants agreed to participate in the study, secondary and post secondary teachers followed the link to an online Survey Monkey questionnaire and completed the forty-eight questions to the best of their ability. Once completed, participants submitted the survey

electronically through Survey Monkey. Participation was entirely voluntary, and participants were not offered any incentives. There were 219 emails sent out in total. The response rate was 9.13%.

Chapter Three: Results:

Data analyses were conducted using SPSS for Windows. Descriptive statistics and tables were used to present results addressing the five-research questions. An omnibus repeated-measures ANOVA model with a Post-Hoc test were performed to compare mean scores of teachers' knowledge of the effects caused by a mTBI. A Chi-Square test was used to examine if perceived knowledge differed with the following characteristics: history of mTBI training, level of teaching, years of teaching experience, and history of student(s) with mTBI. A Chi-Square test was used because the dependent variable was ordinal so it was categorical data (Sharpe, 2015).

1) What is the current knowledge of symptoms and learning impacts of current high school and post-secondary teachers about mild traumatic brain injuries?

Knowledge of symptoms. In order to address teachers' knowledge of the symptoms of mTBIs, I examined their responses to the questions in which they were asked to rate the likelihood and longevity of a series of potential symptoms. The top three symptoms they identified as very likely to occur were headache, dizziness, and difficulty concentrating. These symptoms are some that are included in the most common symptoms known to general public, and usually are generally talked about when speaking about concussions (American Association of Neurological Surgeons [AANS], 2015). Symptoms such as "difficulty swallowing" and "difficulty sitting", which are not currently recognized as symptoms when sustaining a concussion, were perceived to be very likely symptoms by some participants. This may suggest that participants think any symptom they see listed could be a potential concussion symptom. The only three symptoms that any participants chose as "very unlikely" were difficulty swallowing, upset stomach, and difficulty making friends. Out of those three, difficulty making

friends is seen as a more common social symptom since sustaining a mTBI can affect one's social skills to interact with others (Rosema, Crowe, & Anderson, 2012). Overall, this suggests that teachers were familiar with common symptoms, but willing to endorse any potential symptom.

Table 2

Participants' response to "Which of the following symptoms can occur from concussions?" (%)

	Very Unlikely	Unlikely	Likely	Very Likely
Headache	-	-	15	85
Dizziness	-	-	20	80
Feeling of loneliness	-	30	5	15
Difficulty sitting	-	30	40	30
Nausea	-	5	25	70
Difficulty making friends	15	20	50	15
Light sensitivity	-	-	30	70
Fine motor skills	-	10	40	50
Upset stomach	5	15	45	35
Depression	-	15	45	40
Difficulty swallowing	5	35	55	5
Noise sensitivity	-	5	25	70
Writing ability	-	5	65	30
Difficulty concentrating	-	-	25	75
Clumsiness	-	5.3	42.1	52.6
Memory deficits	-	-	35	65

When looking at duration of potential concussion symptoms (Table 2), headaches, depression, and difficulty concentrating were perceived by participants to be the symptoms most likely to last for a year or more. Overall, participants perceived most symptoms to last for a longer duration, from one month all the way up to a year or more.

Table 3

Participants' response to "How long can effects from a concussion last for?" (%)

	1-3 days	2-3 weeks	1-2 months	Up to 1 year or more
Headache	-	10.5	15.8	73.7
Dizziness	5.3	10.5	31.6	52.6
Feeling of loneliness	11.1	16.7	22.2	50
Difficulty sitting	5.3	36.8	15.8	42.1
Nausea	15.8	21.1	26.3	36.8
Difficulty making friends	22.2	5.6	16.7	55.6
Light sensitivity	-	5.3	31.6	63.2
Fine motor skills	-	22.2	27.8	50
Upset stomach	21	21.1	26.3	31.6
Depression	-	5.3	15.8	79
Difficulty swallowing	44.4	5.6	16.7	33.3
Noise sensitivity	-	-	36.8	63.2
Writing ability	-	21.1	31.6	47.4
Difficulty concentrating	-	-	26.3	73.7
Clumsiness	-	21.1	21.1	57.9
Memory deficits	-	-	31.6	68.4

Knowledge of effects. In order to address teachers' knowledge of the effects of mTBI on individuals, I examined the questions that addressed longer-term impacts. Looking at the average scores (Table 4), physical, emotional, and cognitive effects were the categories that educators had most knowledge about with the highest amount of knowledge being in physical effects (3.85), followed by cognitive effects (3.59). Social effects with a score of 2.95 showed to be the category educators had the least amount of knowledge in. An omnibus repeated measures ANOVA found that this difference in means was significant, $F(4,16) = 13.12$, $p < .001$, partial $\eta^2 = .41$. Post Hoc tests revealed significant differences between physical and emotional effects, $t(19) = 2.44$, $p = .025$, physical and social effects, $t(19) = 5.82$, $p < .001$, for physical and cognitive effects, $t(19) = 3.30$, $p = .004$, and for physical and academic effects, $t(19) = 5.60$,

$p<.001$. Emotional and social effects yielded significant differences as well, $t(19) = 2.73$, $p=.013$, as well for emotional and academic effects, $t(19) = 2.20$, $p = .040$, but not between emotional and cognitive effects, $t(19) = -.781$, $p = .445$. There were significant difference between social and cognitive effects, $t(19) = -5.26$, $p < .001$, cognitive and academic effects, $t(19) = 4.42$, $p < .001$, but not between social and academic effects, $t(19) = -1.69$, $p = .107$.

Table 4

Mean scores (and standard deviation) of participants' knowledge of potential effects occurring from mTBIs

Physical	3.85 (.37)
Emotional	3.47 (.66)
Social	2.95 (.72)
Cognitive	3.59 (.32)
Academic	3.18 (.45)

Note: n = 20. See questions 4-25 in Appendix for the potential effects. To get mean scores, potential effects were categorized into the five categories listed above.

2) What experience do current high school and post-secondary teachers report with mild traumatic brain injuries in the classroom?

When asked whether they had ever worked with a student who had sustained a mTBI, 50% of participants said yes, and 50% said no. Regarding that experience, participants were asked how they emotionally felt during that experience. The majority of participants who had experienced having a student with a mTBI before, felt neutral about their experience (Table 5).

Table 5

Participants' response to their emotional experience of having a student in their class who had sustained a mTBI (%)

Nervous and/or anxious	18.8
Neutral	31.3
Confident	18.8
Does not apply to me	31.3

To further explore teachers' experiences, we asked what strategies and accommodations they had used in the classroom, and which they found most helpful. The three most popular accommodations/strategies that secondary and post-secondary teachers have applied in their classrooms before are: allowing the student to take breaks when needed, scheduling a meeting with the student, and decreasing the amount of work for that student. Strategies often used by participants were, providing assignment extensions and allowing the student to take how the work to do on their own time (Table 6). The least popular accommodations/strategies used by participants with a student who has suffered a mTBI, were contacting the school nurse, if the option was available, providing a scribe, contacting a guidance counselor, contacting the parents, and moving a desk closer to a SMARTboard, (Table 6).

Table 6

Participants' response to "Which of the following accommodations have you applied in your classroom in regards to a mTBI experience?" (%)

	Never	Rarely	Sometimes	Often	Always
Dim or shut off the lights	10	-	20	40	20
Allowance to take breaks when needed	10	-	10	30	40
Excusal from assignments	20	-	40	30	10
Assignment extensions	-	-	20	60	20
Contact guidance counselor for a meeting	30	20	30	-	-
Leave class to take 5-15min walks	20	20	30	20	-
Allowance to work in separate room during class time	10	20	10	40	10
Pre-copied notes	20	20	20	20	20
Contact parents for a meeting	30	10	10	30	10
Desk moved closer to SMARTboard	30	10	30	10	-
Allow student to take home work to do on own time	10	-	20	50	20
Provide a tutor or tutoring services	20	20	20	10	10

Provide a scribe	30	30	30	-	-
Excusal from classes with loud sounds	10	10	30	20	20
Excusal to leave class early to avoid busy halls	10	20	30	20	10
Contact school nurse if option is available	50	-	-	-	10
Schedule a meeting with student	-	10	20	20	30
Decrease the amount of work for the student	20	-	20	20	30
Breaking down larger assignments into smaller steps	20	-	30	20	20

Note: Responses account only for participants who have had experience with working with a student with a mTBI

Of the accommodations provided on the questionnaire, the two that were rated with the highest percentage of being helpful were providing assignment extensions and decreasing the amount of work for the student (Table 7). Similarly, regarding the response for which accommodations had teachers used before, the least helpful accommodations were contacting a school nurse if available, providing a scribe, providing a tutor or tutoring services, and moving the student's desk closer to a SMARTboard (Table 7).

Table 7

Participants' response to "How successful were each of these strategies in assisting the student in returning to learn?"(%)

	Not at all	A little	Somewhat	Very
Dim or shut off the lights	-	10	40	30
Allowance to take breaks when needed	-	10	30	40
Excusal from assignments	10	30	20	30
Assignment extensions	10	10	10	70
Contact guidance counselor for a meeting	30	30	20	-
Leave class to take 5-15min walks	30	10	30	10
Allowance to work in separate room during class time	-	30	20	30
Pre-copied notes	-	40	20	30
Contact parents for a meeting	10	10	10	40
Desk moved closer to SMARTboard	40	-	10	20

Allow student to take home work to do on own time	-	20	40	40
Provide a tutor or tutoring services	40	10	10	20
Provide a scribe	50	20	10	10
Excusal from classes with loud sounds	20	-	50	10
Excusal to leave class early to avoid busy halls	20	20	30	10
Contact school nurse if option is available	60	-	-	10
Schedule a meeting with student	10	10	30	20
Decrease the amount of work for the student	-	-	30	50
Breaking down larger assignments into smaller steps	-	-	40	40

Note: Responses account only for participants who have had experience with working with a student with a mTBI

3) What strategies for returning to learn post-mTBI are current high school and post-secondary teachers familiar with?

In order to examine the strategies that teachers were familiar with, independent of their prior experience, I asked three questions in which participants were asked to read the scenario and then choose which accommodations/strategies they would personally use to assist the student in the scenario.

Scenario one included a student who was having trouble concentrating and copying things from the SMARTboard. For Scenario one, the top accommodations that teachers would use in this case were moving the student's desk closer to a SMARTboard, allowing the student to take breaks when needed, and breaking down assignments into smaller steps, excusing the student from classes with louder sounds, and allowing the student to work in a separate room during class time (Table 8).

Table 8

Participants' response to "How likely would you be to apply the following accommodations?" for Scenario #1 (%)

	Not likely at all	Somewhat likely	Likely	Very likely
Dim or shut off the lights	5	15	30	50
Allowance to take breaks when needed	5	5	30	60
Excusal from assignments	25	40	15	20
Assignment extensions	5	10	35	50
Contact guidance counselor for a meeting	26.3	10.5	31.6	31.6
Leave class to take 5-15min walks	20	25	25	30
Allowance to work in separate room during class time	5	15	25	55
Pre-copied notes	5.3	10.5	42.1	42.1
Contact parents for a meeting	10.5	31.6	26.3	31.6
Desk moved closer to SMARTboard	-	21.1	15.8	63.2
Allow student to take home work to do on own time	-	10	40	50
Provide a tutor or tutoring services	20	35	10	35
Provide a scribe	22.2	33.3	27.8	16.7
Excusal from classes with loud sounds	5	25	15	55
Excusal to leave class early to avoid busy halls	15	25	20	40
Contact school nurse if option is available	30	10	25	35
Schedule a meeting with student	10	5	40	45
Decrease the amount of work for the student	5	30	30	35
Breaking down larger assignments into smaller steps	10	-	35	55

Note: Scenario 1 includes a student who has returned back to school after suffering a mTBI and is complaining of having trouble concentrating during class time and difficulty copying things from the SMARTboard.

Scenario two included a student who is having headaches and noise sensitivity issues. The top accommodations that teachers would use in this case were excusing the student from classes with loud sounds, excusing the student from class early to avoid busy halls, allowing the

student to take home their work to complete on their own time, and allowing the student to take breaks when needed (Table 9).

Table 9

Participants' response to "How likely would you be to apply the following accommodations?" for Scenario #2 (%)

	Not likely at all	Somewhat likely	Likely	Very likely
Dim or shut off the lights	15	20	40	25
Allowance to take breaks when needed	5	15	30	50
Excusal from assignments	55	25	20	-
Assignment extensions	5	15	45	35
Contact guidance counselor for a meeting	26.3	26.3	15.8	31.6
Leave class to take 5-15min walks	15	15	35	35
Allowance to work in separate room during class time	-	10.5	36.8	52.6
Pre-copied notes	10.5	42.1	15.8	31.6
Contact parents for a meeting	21.1	10.5	31.6	36.8
Desk moved closer to SMARTboard	21.1	21.1	36.8	21.1
Allow student to take home work to do on own time	-	22.2	27.8	50
Provide a tutor or tutoring services	42.1	26.3	10.5	21.1
Provide a scribe	36.8	42.1	15.8	5.3
Excusal from classes with loud sounds	-	10.5	26.3	63.2
Excusal to leave class early to avoid busy halls	5.3	10.5	31.6	52.6
Contact school nurse if option is available	31.6	5.3	21.1	42.1
Schedule a meeting with student	10	10	40	40
Decrease the amount of work for the student	21.1	36.8	15.8	15.8

Breaking down larger assignments into smaller steps	10	10	55	25

Note: Scenario 2 includes a student has been cleared to return back to school after suffering a mTBI but occasionally complains of headaches due to noise from the classroom and others rooms that echo sounds.

Scenario three included a student who is having trouble concentrating and completing their schoolwork. The top accommodations that teachers would use in this case were scheduling a meeting with the student, providing assignment extensions, and allowing the student to take home their work to complete on their own time (Table 10).

Table 10

Participants' response to "How likely would you be to apply the following accommodations?" for Scenario #3 (%)

	Not likely at all	Somewhat likely	Likely	Very likely
Dim or shut off the lights	30	15	40	15
Allowance to take breaks when needed	15	5	45	35
Excusal from assignments	40	25	20	15
Assignment extensions	10.5	10.5	26.3	52.6
Contact guidance counselor for a meeting	21.1	5.3	47.4	26.3
Leave class to take 5-15min walks	20	15	55	10
Allowance to work in separate room during class time	10.5	10.5	47.4	31.6
Pre-copied notes	21.1	26.3	36.8	15.8
Contact parents for a meeting	15.8	-	42.1	42.1
Desk moved closer to SMARTboard	15.8	21.1	47.4	15.8
Allow student to take home work to do on own time	10.5	-	42.1	47.4
Provide a tutor or tutoring services	21.1	42.1	15.8	21.1
Provide a scribe	31.6	36.8	21.1	10.5
Excusal from classes with loud sounds	21.1	26.3	26.3	26.3

Excusal to leave class early to avoid busy halls	21.1	31.6	21.1	26.3
Contact school nurse if option is available	31.6	10.5	26.3	31.6
Schedule a meeting with student	10	10	20	60
Decrease the amount of work for the student	15.8	31.6	26.3	26.3
Breaking down larger assignments into smaller steps	10	-	50	40

Note: Scenario 3 includes a student who attending school after suffering a mTBI with their full class schedule, and you notice that they are having trouble concentrating, trouble finishing tests/assignments, but the student is not reporting any symptoms.

4) Are current high school and post-secondary teachers aware of any information regarding mTBI protocol, or if given the option would they like to have some information?

68.4% of participants have not taken or had any course, conference, or workshop focused on concussions before, while only 31.6% have (Table 11). Though majority of participants have not had training, of those who have partaken in some sort of concussion training, 28.6% had taken a course, 14.3% had taken a workshop and 57.1% had done something other such as short online training, an online training module, a training program at a hospital due to their own concussion, or sustaining their own concussion and dealing with the consequences (Table 11). Of those participants who have had some type of concussion related training, 42.9% were given some sort of extra material(s) to bring back to their classroom to use (Table 11). Of those participants who had taken some sort of training related to concussions, signs and symptoms were the most popular topic covered, with the origin, effect on learning, and strategies all being covered in lesser amounts (Table 12).

Table 11

Participants who have taken part in concussion related training (%)

Total participants with concussion training	31.6

Type of training*	
Course	28.6
Conference	-
Workshop	14.3
Other	57.1
Take home material provided*	
Yes	42.9
No	57.1

*Responses account only for participants who answered yes to taking concussion related training

Table 12

Information that was covered in the concussion related training taken by participants (%)

	Not at all	Somewhat	Covered	Thoroughly
The origin of the injury	-	33.3	33.3	33.3
Signs/symptoms	-	16.7	33.3	50
Effects on learning	-	33.3	33.3	33.3
Strategies to assist students in the classroom/ returning to learn	-	33.3	33.3	33.3

Note: Responses account only for participants who answered yes to taking concussion related training

Looking more broadly at awareness of where information could be accessed, participants' responses showed that majority (36.8%) are 'somewhat aware' of any access to information, while 21.1% are very aware, and 21.1% are not aware at all of any information (Table 13).

Table 13

Participants' response to "Are you aware of any access to information regarding concussion protocol in the school?" (%)

Not at all aware	21.1
Somewhat aware	36.8
Aware	21.1
Very aware, I've seen it	21.1

The majority (45%) of participants strongly agreed that if given the option they would like to have information regarding concussion protocol provided to them for their classroom(s), while only 5% would not want any information at all (Table 14). When given the options of

obtaining information to learn more about the origin of the injury, signs and symptoms, effects on learning, and/or strategies to assist students, participants strongly agreed that strategies (80%) and effects on learning (80%) were important followed by signs and symptoms (70%) (Table 14).

Table 14

Participants' response to "If given the option would you like to have information provided to you for your classroom?" and "Is there information you would like to learn about concussions?"(%)

	Strongly disagree	Somewhat disagree	Unsure	Somewhat agree	Strongly agree
Total preference of having information available	5	5	10	35	45
Information/content preferred					
The origin of the injury	10.5	10.5	10.5	47.4	21.1
Signs/symptoms	-	5	5	20	70
Effects on learning	-	5	-	15	80
Strategies	-	5	-	15	80

5) How does one's level of teaching, mTBI training, and experience with mTBIs in the classroom impact one's perceived knowledge?

In order to address this question, we asked participants to rate their perceived knowledge about mTBIs. We found that the majority of secondary and post-secondary teachers perceived their knowledge relating to mTBIs to be between having very little to having some knowledge (Table 15).

Table 15

Participants' response to "How would you rate your knowledge of concussion injuries?" (%)

None	5
Very Little	35
Some	50

Very	10

In order to address whether this differed based on their experiences, training and teaching level, I conducted a series of Chi-Squared tests. A Chi-Square test was used because the dependent variable, perceived knowledge, was ordinal so it was categorical data (Sharpe, 2015). There were no statistical significant differences on perceived knowledge of mTBI by history of mTBI training $\chi^2(3) = 2.669$, p= .446, level of teaching $\chi^2(3) = 2.569$, p= .463, or years of teaching experience $\chi^2(6) = 2.524$, p= .866. However, there was a significant difference between perceived knowledge and history of a student with a mTBI, $\chi^2(3) = 8.171$, p= .043. This suggests that those participants who had had a student in their classroom with a mTBI perceived themselves to have higher knowledge regarding mTBIs, and that was the only factor that seemed to make an impact on perceived knowledge.

Chapter Four: Discussion:

The results of this survey suggest that overall there is some, but not a widespread amount, of knowledge of mild traumatic brain injuries and their effects in secondary and post-secondary educational professionals. Secondary and post-secondary educators were aware of the most popular identified symptoms such as headache, dizziness, and difficulty concentrating, which are commonly identified in the literature, media, and within the general public (AANS, 2015). Less prominent symptoms, such as the feeling of loneliness and other social difficulties, were less commonly identified which suggests limits to the breadth of knowledge in educators. Similarly, symptoms that are currently not recognized as symptoms, such as difficulty swallowing, were identified by many participants, suggesting that secondary and post-secondary educators may think that any symptoms could be plausible.

We found that knowledge of the effects related to physical, cognitive, social, emotional, and academic well-being was relatively high. Physical effects, such as headache, were the most familiar to participants having the highest mean score of 3.85 (out of 4.0), which was consistent with previous questions, as physical effects such as headaches are widely and generally known negative effects of mild traumatic brain injuries (AANS, 2015). Cognitive and emotional effects were both very close in score, 3.59 and 3.55 respectively, suggesting that participants were familiar with these effects, though not as much as with physical effects. The close mean scores could be a product of these cognitive and emotional effects occasionally being categorized together. These effects can be seen as impacts of one another (eg. difficulty concentrating, a cognitive effect, can potentially cause irritability, an emotional effect), or more commonly, emotional effects are classified within cognitive effects. It was surprising that knowledge regarding academic effects was on the lower end (3.22) since it was in-service educators who

were participating in the study, and research suggests that individuals who have sustained a concussion are three times less likely to finish High School (Anderson et al., 2009). Having a lower average score in this section potentially shows that more training is required for educators so that they can become more knowledgeable in helping themselves as well as students. Social effects such as feeling lonelier and difficulty developing new relationships, scored the lowest at 2.95 suggesting that participants were least familiar with these types of effects and may benefit from training in this area also.

It was interesting that only 50% of participants indicated having ever worked with a student who had sustained a mTBI. With the high prevalence of adolescents sustaining mild traumatic brain injuries (Gessel, Fields, Collins, Dick, & Comstock, 2007; Hachem, Kourtis, Mylabathula, & Tator, 2016), but lower response of educators having worked with students who had sustained one, it may suggest that some participants were not aware of having a student present in their classroom who was returning to the learning environment. This could be related to not recognizing symptoms and effects, or not being informed by administration, the student, or student's parents or guardians.

I found that, for those educators who had experienced a student who had sustained a mTBI (n=10), popular accommodations/strategies used were allowing the student to takes breaks when required, scheduling a meeting with the student, and decreasing the amount of work for that student. These strategies are popular strategies to use in the classroom when working with students who have sustained a mTBI (McGrath, 2010; Halstead et al., 2013), are specifically used when working on decreasing risk of cognitive exertion (Halstead et al., 2013), as well as information retention (Pershelli, 2007). The least favored accommodation/strategy was contacting the school nurse if that option was available, scoring at 50% of never using,

suggesting that the schools or post-secondary institutes where the participants work may not have a school nurse on site. Of those educators (n=10) who had had experience with a student who had sustained a mTBI, providing assignment extensions and decreasing the amount of work for the student were found to be the most useful accommodations/strategies, while 60% of participants with experience rated contacting a school nurse scored as not being useful at all.

Overall, I found the top accommodations/strategies teachers would use when presented with the scenario questions were: allowing the student to take home their work to do on their own time and allowing the student to take breaks when required. Overall, the responses to the scenario questions were consistent with current recommendations (McAvoy, 2012; Halstead et al., 2013; McGrath, 2010), which suggest that when provided with accommodations/strategies to use in hypothetical scenarios, participants are intuitive on which would work best in each situation. This could suggest that if educators were provided with a list of accommodations/strategies that are useful in this situation, it could help them proactively put them to use.

Because mild traumatic brain injuries are being diagnosed more frequently (Gessel et al., 2007; Hachem et al., 2016), and training is mandated for secondary teachers, it was surprising to see that 68.4% of secondary and post-secondary educators who participated had not taken any sort of supplementary training pertaining to mTBIs. Of those who had taken some sort of training, over half had partaken in short online training, an online training module, a hospital training program where they were the patient, or had sustained their own concussion and learned from their own recovery over taking part in a course or workshop. This suggests that there is little supplementary training provided to secondary and post-secondary educators in Ontario. Training on mTBIs is not mandatory in all educational institutes – indeed for post-secondary

instructors, training on student accommodations is rarely required, which could be one reason for the low percentage of mTBI-trained educators. Of those participants who did have some sort of mTBI training, signs and symptoms of mTBIs were covered the most thoroughly, followed by effects on learning, origin of the injury, and strategies to assist students all being covered evenly. Given that these educators are not diagnosing the injury, but are in contact with the student once they return back to school, it may be more beneficial for training programs to focus on impacts on learning and strategies for return (Gioia, Glang, Hooper, & Brown, 2015).

The level to which the educators were aware of any mTBI information that could be accessed in their school (board) or post-secondary institution was lower than expected. With majority of participants only being 'somewhat aware' of information provided, it does not suggest that all educational institutions are knowingly providing accessible information. When asked if participants would like to have information available to them, 45% strongly agreed while 35% somewhat agreed, suggesting that educators are open and eager to have information provided. Regarding participants' preference for type of information provided, participants strongly agreed that both strategies and effects on learning were what they wanted most, followed by signs/symptoms. These results show that educators are potentially willing to learn about mTBIs by having information provided in their schools and post-secondary institutions, and shows exactly what they are keen on learning about.

At the very beginning of the survey, participants were provided with the question of what they thought their perceived knowledge was concerning mild traumatic brain injuries. I found that participants who had a history of a student with a mTBI in their classroom were the only group to show a significantly higher perceived knowledge of mTBIs. This suggests that, though someone may have had mTBI training or have been an educator for many years, the only factor

that appears to have an impact on one's perceived knowledge is directly having experience and working with a student who has sustained a mTBI. Having real life experience working with a student who is returning to the learning environment directly provides the educator with direct knowledge of different accommodations and strategies.

Implications

These results have shown what the current knowledge of mild traumatic brain injuries is in a small sample of educators, and what may still need to be learned by in-service, secondary and post secondary teachers. Ideally, these results can be used to develop new training programs or handouts for teachers and schools. This study suggests that more training is required for both secondary and post secondary teachers. In particular, results showed that educators would like to learn more about strategies and accommodations to use in the classroom. These findings can provide school boards and administrators with a stepping-stone to create strategic aids directed to helping teachers understand the effects of mTBIs, and how to work with students who are returning back to the classroom post mild traumatic brain injury.

This is consistent with my own experiences as a student returning to learn as I noticed some of my professors eager to know more of what they could do to assist me, but did not have the prior knowledge or resources available to them. For those professors that did understand the severity of a mTBI and its impacts, I found that they were familiar with a few strategies (e.g. extensions, postponing assessments), but still relied on me to tell them what I thought should be done or what I wanted to do – which worked in my case because I had the prior knowledge and experience both as a student and educator. In the case of a younger student or an individual who has not sustained a mild traumatic brain injury before, they are not expected to have the prior

knowledge and will be looking to others for guidance, so it is up to educators to have some sufficient comprehension of what they can do to assist the student as their teacher.

Future research. The current study examined the current state of knowledge for teachers at the secondary and post-secondary level. Next steps for future research include examining the modality of delivery for future educational professional development pertaining to mild traumatic brain injuries, as results here showed a desire among both secondary and post secondary educators to know more. Additionally, it is necessary to further explicitly explore the accommodations and strategies used by educators to determine what is working and what is not.

Limitations

This study had several important limitations. First, the response rate of the online surveys was quite low, which could be related to a lack of free time to complete a survey during the winter school term for secondary and post-secondary instructors. Additionally, the results of this study are not a proper representation of the target population of in-service secondary and post secondary teachers, as the participants surveyed were situated solely in Northern Ontario. Finally, the online questionnaire having structured, close-ended, questions instead of open-ended questions may have limited the outcomes.

Conclusion

The goal of training is to educate individuals in a certain subject so that they can become more knowledgeable and feel prepared when the time comes to put their training to use. To achieve this goal in respect to mild traumatic brain injuries, mTBI (concussion) training needs to be implemented for both secondary and post secondary educators so that when they have a

student return to their classroom after sustaining a mTBI, they are confident in assisting that student.

The main objectives of this study were to examine the knowledge of in- service secondary and post-secondary teachers in mild traumatic brain injuries, familiarity of strategies/accommodations to use in the classroom with students returning to learn, and to examine if educators were receiving mTBI training and what areas they would like to learn more about. The survey suggests that overall, there are some knowledge gaps regarding the nature and educational effects of mild traumatic brain injuries but educators were quite familiar with a variety of strategies and accommodations. As mTBIs become more frequent (Gessel et al., 2007; Hachem et al., 2016), having a strong foundation in identifying symptoms that affect learning, and strategies to use when working with students returning to learn, is essential for educators of all levels.

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Appendix A

Return to learning in the classroom: Knowledge and experience of in-service, secondary and post secondary teachers on mild traumatic brain injuries

1. How would you rate your knowledge of concussion injuries?

None	Very Little	Some	Very
○	○	○	○

2. Which of the following symptoms can occur from concussions?

	Very Unlikely	Unlikely	Likely	Very Likely
Headache	○	○	○	○
Dizziness	○	○	○	○
Feeling of loneliness	○	○	○	○
Difficulty sitting	○	○	○	○
Nausea	○	○	○	○
Difficulty making friends	○	○	○	○
Light sensitivity	○	○	○	○
Fine motor skills	○	○	○	○
Upset stomach	○	○	○	○
Depression	○	○	○	○
Difficulty swallowing	○	○	○	○
Noise sensitivity	○	○	○	○
Writing ability	○	○	○	○
Difficulty concentrating	○	○	○	○
Clumsiness	○	○	○	○
Memory deficits	○	○	○	○

1

3. How long can effects from a concussion last for?

	1-3 days	2-3 weeks	1-2 months	Up to 1 year or more
Headache	○	○	○	○
Dizziness	○	○	○	○
Felling of loneliness	○	○	○	○
Difficulty sitting	○	○	○	○
Nausea	○	○	○	○
Difficulty making friends	○	○	○	○
Light sensitivity	○	○	○	○
Fine motor skills	○	○	○	○
Upset stomach	○	○	○	○
Depression	○	○	○	○
Difficulty swallowing	○	○	○	○
Noise sensitivity	○	○	○	○
Writing ability	○	○	○	○
Difficulty concentrating	○	○	○	○
Clumsiness	○	○	○	○
Memory deficits	○	○	○	○

4. Concussions have the potential to impact one's memory.

Strongly Disagree	Somewhat Disagree	Somewhat Agree	Strongly Agree
○	○	○	○

5. Concussions have the potential to affect an individual's ability to retain and process new information.

Strongly Disagree	Somewhat Disagree	Somewhat Agree	Strongly Agree
○	○	○	○

6. Concussions have the potential to affect one's academic success.

Strongly Disagree	Somewhat Disagree	Somewhat Agree	Strongly Agree
○	○	○	○

7. The ability to switch from one task to another is affected after suffering a concussion.

Strongly Disagree	Somewhat Disagree	Somewhat Agree	Strongly Agree
○	○	○	○

2

8. The degree of impairment to the ability to switch from one task to another is related to the degree of severity of a concussion.

Strongly Disagree	Somewhat Disagree	Somewhat Agree	Strongly Agree
○	○	○	○

9. Concussions have the potential to affect an individual's ability to plan a course of action.

Strongly Disagree	Somewhat Disagree	Somewhat Agree	Strongly Agree
○	○	○	○

10. Concussions have the potential to affect an individual's decision-making skills.

Strongly Disagree	Somewhat Disagree	Somewhat Agree	Strongly Agree
○	○	○	○

11. Concussions have the potential to affect one's attention.

Strongly Disagree	Somewhat Disagree	Somewhat Agree	Strongly Agree
○	○	○	○

12. Concussions can be a cause of ADHD.

Strongly Disagree	Somewhat Disagree	Somewhat Agree	Strongly Agree
○	○	○	○

13. Concussions have the potential to make an individual feel lonelier.

Strongly Disagree	Somewhat Disagree	Somewhat Agree	Strongly Agree
○	○	○	○

14. Concussions can help in developing new relationships.

Strongly Disagree	Somewhat Disagree	Somewhat Agree	Strongly Agree
○	○	○	○

15. Concussions can affect one's ability to adapt to different social settings.

Strongly Disagree	Somewhat Disagree	Somewhat Agree	Strongly Agree
○	○	○	○

16. Stress and anxiety can exacerbate other symptoms of concussion.

Strongly Disagree	Somewhat Disagree	Somewhat Agree	Strongly Agree
○	○	○	○

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17. Having fewer close friends can be caused by a concussion.

Strongly Disagree	Somewhat Disagree	Somewhat Agree	Strongly Agree
○	○	○	○

18. Problem solving abilities in school are not affected by a concussion.

Strongly Disagree	Somewhat Disagree	Somewhat Agree	Strongly Agree
○	○	○	○

19. Group work with peers is negatively affected after a concussion.

Strongly Disagree	Somewhat Disagree	Somewhat Agree	Strongly Agree
○	○	○	○

20. Concussions increase the chance of developing depression.

Strongly Disagree	Somewhat Disagree	Somewhat Agree	Strongly Agree
○	○	○	○

21. Lack of concentration due to a concussion can last more than a month.

Strongly Disagree	Somewhat Disagree	Somewhat Agree	Strongly Agree
○	○	○	○

22. Headaches due to a concussion can last more than a month.

Strongly Disagree	Somewhat Disagree	Somewhat Agree	Strongly Agree
○	○	○	○

23. Feeling lonely and/or standoffish due to a concussion can last more than two months.

Strongly Disagree	Somewhat Disagree	Somewhat Agree	Strongly Agree
○	○	○	○

24. Depression due to a concussion can last more than two months.

Strongly Disagree	Somewhat Disagree	Somewhat Agree	Strongly Agree
○	○	○	○

25. Adolescents who have experienced concussions are less likely to obtain a High School Diploma.

Strongly Disagree	Somewhat Disagree	Somewhat Agree	Strongly Agree
○	○	○	○

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26. Have you ever had a student in your class who had sustained a mild traumatic brain injury?

- Yes
- No

27. If yes, what emotion best describes your experience with it?

- Nervous and/or anxious
- Neutral
- Confident
- Does not apply to me

28. Which of the following accommodations have you applied in your classroom in regards to a mild traumatic brain injury experience?

	Never	Rarely	Sometimes	Often	Always	N/A - I have not had a student with that injury
Dim or shut off the lights						
Allowance to take breaks when needed						
Excusal from assignments						
Assignment extensions						
Contact guidance counselor for a meeting						
Leave class to take 5-15min walks						
Allowance to work in separate room during class time						
Pre-copied notes						
Contact parents for a meeting						
Desk moved closer to SMARTboard						
Allow student to take home work to do on own time						
Provide a tutor or tutoring services						
Provide a scribe						

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	Never	Rarely	Sometimes	Often	Always	N/A - I have not had a student with that injury
Excusal from classes with loud sounds						
Excusal to leave class early to avoid busy halls						
Contact school nurse if option is available						
Schedule a meeting with student						
Decrease the amount of work for the student						
Breaking down larger assignments into smaller steps						

29. How successful were each of these strategies in assisting the student in returning to learn?

	Not at all	A little	Somewhat	Very	N/A - I have not had a student with that injury
Dim or shut off the lights					
Allowance to take breaks when needed					
Excusal from assignments					
Assignment extensions					
Contact guidance counselor for a meeting					
Leave class to take 5-15min walks					
Allowance to work in separate room during class time					
Pre-copied notes					
Contact parents for a meeting					
Desk moved closer to SMARTboard					
Allow student to take home work to do on own time					
Provide a tutor or tutoring services					

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	Not at all	A little	Somewhat	Very	N/A - I have not had a student with that injury
Provide a scribe	○	○	○	○	○
Excusal from classes with loud sounds	○	○	○	○	○
Excusal to leave class early to avoid busy halls	○	○	○	○	○
Contact school nurse if option is available	○	○	○	○	○
Schedule a meeting with student	○	○	○	○	○
Decrease the amount of work for the student	○	○	○	○	○
Breaking down larger assignments into smaller steps	○	○	○	○	○

30. Scenario #1: A student has just been approved to return back to school after suffering a concussion. They are complaining of having trouble concentrating during class work-time and having trouble copying things down form the SMARTboard. How likely would you be to apply the following accommodations?

	Not likely at all	Somewhat likely	Likely	Very Likely
Dim or shut off the lights	○	○	○	○
Allowance to take breaks when needed	○	○	○	○
Excusal from assignments	○	○	○	○
Assignment extensions	○	○	○	○
Contact guidance counselor for a meeting	○	○	○	○
Leave class to take 5-15min walks	○	○	○	○
Allowance to work in separate room during class time	○	○	○	○
Pre-copied notes	○	○	○	○
Contact parents for a meeting	○	○	○	○
Desk moved closer to SMARTboard	○	○	○	○

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	Not likely at all	Somewhat likely	Likely	Very Likely
Allow student to take home work to do on own time				
Provide a tutor or tutoring services				
Provide a scribe				
Excusal from classes with loud sounds				
Excusal to leave class early to avoid busy halls				
Contact school nurse if option is available				
Schedule a meeting with student				
Decrease the amount of work for the student				
Breaking down larger assignments into smaller steps				

31. Scenario #2: A student has been cleared to be back at school after a concussion, but once in a while they complain that the classroom noise is giving them a headache especially in areas where sound echoes. How likely would you be to apply the following accommodations?

	Not likely at all	Somewhat likely	Likely	Very likely
Dim or shut off the lights				
Allowance to take breaks when needed				
Excusal from assignments				
Assignment extensions				
Contact guidance counselor for a meeting				
Leave class to take 5-15min walks				
Allowance to work in separate room during class time				
Pre-copied notes				
Contact parents for a meeting				

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	Not likely at all	Somewhat likely	Likely	Very likely
Desk moved closer to SMARTboard	○	○	○	○
Allow student to take home work to do on own time	○	○	○	○
Provide a tutor or tutoring services	○	○	○	○
Provide a scribe	○	○	○	○
Excusal from classes with loud sounds	○	○	○	○
Excusal to leave class early to avoid busy halls	○	○	○	○
Contact school nurse if option is available	○	○	○	○
Schedule a meeting with student	○	○	○	○
Decrease the amount of work for the student	○	○	○	○
Breaking down larger assignments into smaller steps	○	○	○	○

32. Scenario #3: At student has been attending school after a concussion with their full class schedule for a few weeks now, but as their teacher you have noticed that since the concussion, they are having difficulty maintaining concentration, and finishing assignments and tests. Though you have noticed this change in behaviour, the student has not reported having any symptoms. How likely would you be to apply the following accommodations?

	Not likely at all	Somewhat likely	Likely	Very likely
Dim or shut off the lights	○	○	○	○
Allowance to take breaks when needed	○	○	○	○
Excusal from assignments	○	○	○	○
Assignment extensions	○	○	○	○
Contact guidance counselor for a meeting	○	○	○	○
Leave class to take 5-15min walks	○	○	○	○
Allowance to work in separate room during class time	○	○	○	○

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	Not likely at all	Somewhat likely	Likely	Very likely
Pre-copied notes	○	○	○	○
Contact parents for a meeting	○	○	○	○
Desk moved closer to SMARTboard	○	○	○	○
Allow student to take home work to do on own time	○	○	○	○
Provide a tutor or tutoring services	○	○	○	○
Provide a scribe	○	○	○	○
Excusal from classes with loud sounds	○	○	○	○
Excusal to leave class early to avoid busy halls	○	○	○	○
Contact school nurse if option is available	○	○	○	○
Schedule a meeting with student	○	○	○	○
Decrease the amount of work for the student	○	○	○	○
Breaking down larger assignments into smaller steps	○	○	○	○

33. Do you think suffering from a traumatic brain injury contributes to one's knowledge about them?

Strongly Disagree	Somewhat Disagree	Unsure	Somewhat Agree	Strongly Agree
○	○	○	○	○

34. Have you ever taken part in a course/conference/workshop focused on concussions or that included concussions?

○ Yes

○ No

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35. Please specify whether it was a course, conference, workshop, or other (please specify if other)

- ◯ Course
- ◯ Conference
- ◯ Workshop
- ◯ N/A
- ◯ Other (please specify)

36. Were you provided with extra material (e.g. booklet, pamphlet, binder) to take back to the classroom for your own use?

- ◯ Yes
- ◯ No
- ◯ N/A

37. If have taken a course, conference, workshop, or other, what information did it cover?

	Nothing covered	Somewhat covered	Covered	Thoroughly covered	N/A - I have not taken a course, etc.
The origin of the injury	◯	◯	◯	◯	◯
Signs/symptoms	◯	◯	◯	◯	◯
Effects of learning	◯	◯	◯	◯	◯
Strategies to assist students in the classroom/returning to learn	◯	◯	◯	◯	◯

38. Are you aware of any access to information regarding concussion protocol in the school?

Not at all aware	Somewhat aware	Aware	Very aware, I've seen it
◯	◯	◯	◯

39. If given the option, would you like to have information provided to you for your classroom?

Strongly Disagree	Somewhat Disagree	Unsure	Somewhat Agree	Strongly Agree
◯	◯	◯	◯	◯

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40. Is there information you would like to learn about concussions?

	Strongly Disagree	Somewhat Disagree	Unsure	Somewhat Agree	Strongly Agree
The origin of the injury	○	○	○	○	○
Signs/symptoms	○	○	○	○	○
Effects on learning	○	○	○	○	○
Strategies to assist students in the classroom/returning to learn	○	○	○	○	○

41. Demographics:

Sex

- ○ Male
- ○ Female
- ○ Prefer not to disclose
- ○ Other

42. Age (years)

- ○ <25
- ○ 25-29
- ○ 30-34
- ○ 35-39
- ○ 40-44
- ○ 45-49
- ○ 50-54
- ○ 55-59
- ○ 60-64
- ○ 65-69
- ○ >69

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43. Ethnicity

- African American
- Caucasian
- Asian
- Hispanic
- First Nations
- Other

44. Are you a Secondary or Post-Secondary teacher?

- Secondary
- Post-Secondary

45. How many years have you been teaching?

- <1
- 1-2
- 3-5
- >5

46. Highest level of Education

- Undergraduate Degree
- Masters Degree
- Doctorate Degree

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47. What subject(s) do you teach? (Please check all that apply)

- [ ] Math
- [ ] Physical Education
- [ ] English
- [ ] History
- [ ] Geography
- [ ] Health
- [ ] Additional Language(s)
- [ ] Other (please specify)

48. Would you be willing to be contacted in the near future to participate in a brief interview for further questioning on mild traumatic brain injuries?

- ○ Yes
- ○ No

If answered yes, you may contact me at (email):

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