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# Traumatic Brain Injuries in Adults: Effects on Pragmatics

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TRAUMATIC BRAIN INJURIES IN ADULTS: EFFECTS ON PRAGMATICS

by

Robyn K. Nickelson

B.S., Southern Illinois University, 2012

A Research Paper

Submitted in Partial Fulfillment of the Requirements for the  
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TRAUMATIC BRAIN INJURIES IN ADULTS: EFFECTS ON PRAGMATICS

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Robyn K. Nickelson

A Research Paper Submitted in Partial

Fulfillment of the Requirements

for the Degree of

Master of Science

in the field of Communication Disorders & Sciences

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## **Introduction**

According to the Center for Disease Control and Prevention (2014), an estimated 2.5 million people suffered from a traumatic brain injury (TBI) in the year 2010. With this number on the rise due to the increase in falls and motor vehicle accidents, it is crucial to investigate the effects these injuries have on the population at large. The ability to effectively use language is often times critically impaired in a variety of ways following such a traumatic event. Examples specific to speech and language skills include impaired topic maintenance, an impaired ability to form and maintain relationships and reduced conversational skills overall. With that said, it is essential to research the effects traumatic brain injuries have on adults' communication, specifically within the area of pragmatic abilities. In an article by Kelli Evans and Karen Hux, pragmatic communication was defined as "the use of language in social contexts (p. 767, 2011)."

## **Impaired Topic Maintenance**

It has been demonstrated that traumatic brain injuries in adults significantly impair the ability to form a detailed and well developed narrative with regards to pragmatics, specifically in terms of topic maintenance, prosody and omission of information. Often times, executive functioning is required in order to construct a well-detailed narrative. With that said, when components of planning and control are impaired, the narrative is unable to be formed with ease and cohesion. According to Biddle, McCabe & Bliss (1996), "The discourse of adults with TBI has been described as reduced in coherence, completeness,

and fluency (p. 448).” Bearing this in mind, individuals with traumatic brain injury often form incomplete narratives, including missing subjects and verbs (1996, p. 448). Fillers are often times used as a compensation strategy to recall words or gain additional time for memory retrieval; however, this makes the narrative more difficult to follow in the end (1996, p. 463). Additionally, these individuals produce narratives with “increased hesitations, pauses, and false starts (1996, p. 449).”

In a study conducted by Tu, Togher, and Power (2011), a 19-year-old man, who suffered a severe traumatic brain injury three years prior, was evaluated on his ability to effectively exchange information in three different communication interactions: a casual conversation, a problem solving task, and a purposeful conversation (p. 562). These three communication situations were selected because of their naturalistic qualities to everyday discourse tasks. Additionally, a problem-solving task was selected as a means to allow for equal opportunities in communication of possible solutions between partners. The communication partners varied in their familiarity with the participant: one being his mother, while the other was his paid caregiver. The purpose of the present study was to examine the participant’s ability to maintain the topic and provide relevant information to the subject at hand. Results indicated that the participant “did not give information in response to comments made by the paid caregiver, which led to a failure in conversational topic development (Tu et al., 2011, p. 568).” The Adapted Global Social Impression Rating Scale was used to judge the completion level of a set task, with higher scores suggesting a

more positive experience. The scale ranges from 0-4: 0.0 represented no completion, 2.0 represented a moderate completion and 4.0 represented a very positive interaction, or greater completion. With the paid caregiver, the participant scored 1.0, which represented an interaction that was “minimally interesting, appropriate, rewarding, and quite effortful (Tu et al., 2011, p. 571).” On the other hand, the participant scored a 2.0 when in conversation with his mother, and it was speculated by the authors that the mother provided more support to the participant in terms of maintaining the topic and directing the exchange. Overall, it can be concluded from previous studies as well as the present one that typically, individuals with TBI are not “stimulating individuals to converse with because they have difficulty maintaining conversational topics and overly rely on prompts by communication partners in conversations (Tu et al., 2011, p. 575).”

### **Omission and Digression**

Aside from a lack of delivering pertinent information in narratives, individuals with TBI also may include irrelevant and unnecessary information in their discourse (Biddle et al., 1996, p. 449). Biddle et al. (1996) found that, “In their narratives, persons with TBI left out more information than their non-injured peers (p. 458).” It has been noted that if an individual with a TBI attempts to contribute information during an exchange, the information is most times irrelevant, or contains unnecessary information not related to the topic at hand (Tu et al., 2011, p. 577). In terms of maintaining the topic, digression is typically seen in these individuals as well. In a study of 11



participants conducted by Dardier et al. (2011), results concluded that “compared to the controls, the patients stuck to the topic of conversation four times less often and digressed more than 10 times more often (p. 367).”

Overall, throughout the study, the two most substantial differences between the control group and participants were difficulties related to staying on topic and avoiding digressions (Dardier et al., 2011, p. 372).

### **Executive Function Correlation**

Currently, there is much debate in the research regarding executive functioning and its role in relation to pragmatic abilities. According to Douglas (2010), these debated executive functioning skills include, “self regulation, allocation of attention, planning, and task management (p. 372).” Additionally, the ability to maintain and manipulate information over time is a process of executive functioning and can therefore be linked to topic maintenance (Douglas, 2010, p. 372). Finally, an executive functioning skill such as the “speed of verbal information processing or the efficiency of language comprehension” can easily influence one’s ability to maintain conversation without losing focus of the topic at hand (Douglas, 2010, p. 372). As a result, a deficit in any of the aforementioned areas could significantly impact one’s ability to construct a thorough and cohesive narrative.

Unfortunately, this breakdown in communication is what several individuals with a traumatic brain injury endure on a daily basis. In a study of 43 individuals, Jacinta Douglas (2010) researched the impact executive functioning skills have on pragmatic outcome in communication between TBI

victims and their relatives. It was discovered that the TBI group encountered several more difficulties than the non-injured control group in six of the 11 tested areas. These areas included: “thinking of the particular word, getting sidetracked by irrelevant parts of conversation, hard to follow group conversations, needing a long time to think before answering, keeping track of main details, and going over and over the same ground (Douglas, 2010, p. 375).” With that being said, there is no doubt that difficulties in communication would exist as a result. Therefore, it is important to conclude that, “this present study demonstrates evidence of a significant association between executive impairment and the extent of pragmatic communication difficulties experienced by individuals with TBI (Douglas, 2010, p. 379).”

In the study by Tu et al. (2011), it was mentioned that during a problem-solving task, the participant studied experienced difficulty generating solutions in addition to defining the problem at hand, which can be associated with impaired executive functioning skills seen in several individuals with TBI (p. 577). The La Trobe Communication Questionnaire was used during this study to measure the overall communicative functioning of the sole participant. This tool has been deemed valid and reliable, allowing for multiple perspectives on the individual’s communication strengths and challenges. It was reported that this particular individual had 26 out of 30 behaviors on the La Trobe Communication Questionnaire that all related to executive functioning breakdown, with the remaining items related to an impairment of nonverbal behaviors (Tu et al., 2011, p. 566). The greatest challenge the participant had

in terms of executive functioning skills during conversation was inhibitory control. Tu et al. stated that the casual conversation was selected as a means to measure the participant's ability to negotiate his social identity, meaning who he is and how he relates to others, as well as social reality, such as what he thinks of the world (2011, p. 575). Due to this impairment in executive functioning, his ability to complete this task was measured as unsuccessful, which is common in most individuals with TBI.

### **Prosody and Paralinguistic Cues**

Another aspect in which the ability to tell a narrative is impaired concerns the way in which the message is conveyed. A common finding in individuals with traumatic brain injury is the inability to express themselves through paralinguistic cues. Examples include, "deficiencies in rate, fluency, and redundancy (Biddle et al., 1996, p. 449)." Wang, Kent, Duffy & Thomas (2005) concluded that "the prosodic abnormalities seem to result from monotone, monopitch, and monoloudness within breath groups and/or from monopattering across breath groups," (p. 232). Within the same article, it was discovered that after analyzing several different emotional variations of tones, individuals with TBI had "significantly reduced ability to control pitch and intensity according to prosodic context, especially for anger, question, and statement situations, (Wang et al., 2005, p. 234)." The authors also noted a change in rate of speech in individuals with traumatic brain injury. The majority of the participants in the Wang et al. study spoke with slow speech (70%), while an additional 30% spoke at an accelerated rate, making them

difficult to understand (2005, p. 233). In the Biddle et al. article, a study of 10 adults with TBI was conducted and results indicated that on the whole, these participants had a tendency to be less articulate than the control group of non-injured peers on a variety of measures (1996, p. 458).

### **Refuting Evidence**

While there is significantly more evidence supporting the concept of pragmatic impairment in individuals with traumatic brain injury, there is evidence suggesting otherwise in terms of the executive function correlation. However, the extent to which these investigations vary is critical to the outcome of their results. Douglas (2010) argued against executive functioning being the most prominent deficit seen in pragmatic impairments. Instead, Cummings suggested that Theory of Mind plays a more major role and is “the core cognitive skill involved in pragmatic function (as cited in Douglas, 2010, p. 378).”

### **General Reflections**

It appears that executive functioning would play a larger role over theory of mind in pragmatic function. While intact functioning of both skills would be ideal, it can be assumed that impaired executive functions such as the inability to plan, attend, and self-regulate would be more telling of a pragmatic impairment when compared to taking another’s perspective or prediction of social behavior. Due to the lesion site of most TBIs typically being among the frontal lobe, it is also logical to assume that these components of language would be impaired in relation to social use.

### **Internal Validity Threats**

It was noted while conducting the literature review that there were aspects that could have affected the overall success of the studies. For example, in the study conducted by Wang et al. (2005), 12 individuals with TBI were examined and acoustic measures were taken frequently to indicate the level of pitch, stress, and rate in the participants' discourse. This frequency of measures may be problematic for internal validity if the instrumentation became uncalibrated during the course of the study. The authors indicated that they used high quality microphones, a digital audio tape recorder, digital audiotapes, and CSpeech software TF-32 (Wang et al., 2005, p. 235-239). Therefore, it would be necessary to calibrate each device before each participant gave a speech sample to ensure accurate and reliable data collection.

Additionally, in Turkstra's (2008) study of 19 individuals with TBI, it was stated that due to the small sample size, the research may lack some beneficial components such as observation of differences in the gender of participants and the site of the injury (p. 406). Furthermore, the participants were not asked about their level of social interaction and exchanges prior to his/her injury, so the ability to make accurate inferences would likely depend on the individual's amount of previous experience in this area (2008, p. 406).

### **External Validity Threats**

A concern of external validity regarding the investigations mentioned involves the varying degrees of severity of the participants involved. While most

individuals were of a severe degree, there were individuals in some studies with mild and moderate degrees, as well. This raises the question regarding the ability to generalize findings. Another area in which a concern of external validity arises is the communication partner that these studies used to measure their interactions. People are more likely to successfully communicate with those in which they spend the most time interacting. On the other hand, a communication breakdown is more likely between unfamiliar interlocutors. Several studies used significant others or caretakers as the communication partner which may result in successful communication, but may not be generalizable to others in the population.

### **Reduced Conversational Skills**

Although many individuals with TBI engage in communication with others, it is often times one-sided and lacking diversity in content. For example, several studies have found that individuals with traumatic brain injuries tend to repeat themselves in addition to choosing a “safe” topic to rehearse with individuals at every exchange. We can conclude that traumatic brain injuries in adults have a significant impact on pragmatic abilities, specifically topic repetitiveness and turn taking, which therefore limits the success of conversational skills.

### **Topic Repetitiveness**

In a study by Body and Parker (2004), one man with a traumatic brain injury was observed and analyzed in terms of topic repetitiveness. Several interlocutors described his communication abilities as expressing “limited or

repetitive ideas,” as well as indicating that he would frequently “go over the same ground in conversation” (Body & Parker, 2004, p. 384). When he was instructed to choose the topic of discussion, he repeatedly went back to the same two topics: a vacation he once took, and how to grow chrysanthemums. His wife attempted to divert him to a new subject several times throughout their discourse, but he always came back to the same two topics. Additionally, the man would carry on the redundant conversation without knowing when to end. The same article stated, “people could stand up, open a door ready to leave and say ‘I really need to go now’ and still Bernard would press on, sometimes pursuing his interlocutor out of the room (Body & Parker, 2004, p. 388).” The authors of this article hypothesized that Bernard may resort back to a safe topic as a compensation strategy because he could not come up with new ideas or because of an insensitivity to the presence of his communication partner (2004, p. 389). In conclusion, “it is hypothesized that TBI may impair the ability to register social signals, requiring interlocutors to employ strong conversational mechanisms to divert any repetitiveness (Body & Parker, 2004, p. 390).”

### **Turn-Taking and Intentions of the Communication Partner**

A crucial component to communication is the ability to understand the emotional state of one’s conversational partner. With that said, turn-taking is key to ensuring this component is carried out successfully, where both partners alternate their exchanges to carry out a fluid and relevant conversation. Without being able to read your communication partner’s

intention, turn-taking may become one-sided or nonexistent. In an article by Braden et al. (2010), it was stated that several individuals with TBI had a difficult time adjusting their communication skills given the social situation. Additionally, they may have “decreased social perception and misunderstand the intentions, inferences and emotions of conversation partners (Braden et al., 2010, p. 1299).”

In another study by Muller et al. (2010), 15 individuals with traumatic brain injury were given 20 comic strips each with three pictures that focused on a specific mental state or intention of the character. After examining each picture, the participants were asked to select one of three appropriate conclusions to the scenario on answer cards. There was only one logical conclusion to choose from and two distractors. The participants were required to read physical cues given in the short comic strip in order to detect the character’s intention and therefore, select the appropriate conclusion to the comic strip. Results revealed that individuals with TBI made more errors inferring a character’s intention when compared to their non-injured peers (Muller et al., 2009, p. 1092).

In the Turkstra (2008) article, it was stated that “the most common pragmatic communication deficits observed in individuals with TBI are in generating accurate inferences (e.g., to understand sarcasm and irony) and producing coherent, well-organized discourse (p. 398).” Nineteen individuals with moderate-to-severe traumatic brain injuries in addition to 19 typically developing (TD) adults were studied to characterize varying performance on the



Video Social Inference Test (VSIT). The purpose of this test was to replicate the social inferences that may occur in daily life, which require both initial social inferences and predictions of the resulting behaviors. The importance of social inference is critical to daily living, as it is used in multiple settings on any given day. Some situations that require social inferences include deciding when it is appropriate to tell a joke, whether or not to continue engaging in a topic of conversation with an uninterested social partner, knowing how and when to vary emotional output to others, etc. According to Turkstra (2008), “these social inferences contribute to one’s understanding of others’ intents and thoughts and influence both one’s own actions and expectation for the actions of others (p. 397).” Results from the study indicated that those characterized in the typically developing group scored significantly higher than those individuals in the TBI group for both the VSIT and the Reading the Mind in the Eyes Test (Turkstra, 2008, p. 403).

### **Limited Success in Reaching Communicative Goals**

Studies find that often times, spontaneous gestures or other unnecessary non-verbal behaviors accompanied the speech of those who experienced traumatic brain injury. More specifically, it has been found that individuals with anomia, or word-retrieval deficits secondary to TBI are perceived less favorably by their peers because of these non-verbal behaviors. The physical appearance of the speaker and his/her actions have been found to influence the opinions of the listener, as discussed in the article by Cannizzaro, Allen and Prelock (2011). When the gestures or other non-verbal behaviors are

unrelated to the content of the linguistic message, it is judged as inappropriate or atypical by the listener. For this particular population, this has been found to be a common perception among many. “Since peer perceptions are a potential indicator of social success, it is likely that these behaviours will further jeopardize an already fragile social framework for individuals with TBI who commonly present with these symptoms (Cannizzaro, Allen & Prelock, 2011, p. 550).” With that said, it becomes a challenge for these individuals to meet the communicative goal if his/her listener is unable to focus on the content of the message, but rather solely the delivery.

### **Difficulty with Regulation of Conversation**

In a study by Yim et al. (2011), it was reported that an impaired ability to detect facial affect would significantly reduce the quality of communication with others (p. 277). Within the same article, it was hypothesized that individuals with localized lesions may encounter more difficulty in terms of recognizing, identifying and matching facial expressions to the intended emotions. Evidence from several prior studies suggested that those with left hemispheric injuries were less likely to encounter difficulty in this area when compared to those with right hemispheric injuries, due to the right side being more dominant in identifying facial affect (Yim et al., 2011, p. 278). Additionally, results found that “people with TBI are significantly worse at recognizing anger, disgust, sadness, and fear than recognizing positive facial emotions like happiness, joy, and surprise (Yim et al., 2011, p. 278).” Without

the ability to detect negative emotions such as those listed above, an individual would likely experience difficulty regulating conversation.

### **Refuting evidence**

Although evidence has shown that individuals with TBI perform poorer than non-injured peers on tasks of social inferences, it is often dependent upon the task they are given. For example, Turkstra (2008) studied the effect that picture- and story-based assessments have on individuals with TBI in terms of social inference abilities. Her study found individuals with TBI perform less accurately when identifying social cues and formulating inferences from static tasks. However, it was acknowledged that individuals may perform better in real-life scenarios, rather than static picture or story-based tasks. Turkstra (2008) suggested that although individuals may be given more time to interpret a static image, they lose the ability to detect verbal and non-verbal cues normally experienced during a continuous communication situation (p. 398). Furthermore, “there is evidence that individuals with TBI who perform poorly on static tasks can perform like their peers in extemporaneous conversational contexts (Turkstra, 2008, p. 398).”

### **General reflections**

Although it is understood why some of the behaviors exhibited by individuals with TBI would likely influence the success of communication, researchers should take into effect the likelihood of non-injured peers to exhibit the same characteristics. For example, many typically developing individuals gesture frequently with their hands, even when it is not necessary. The

gestures do not always accompany the intended verbal message, but sometimes present as a nervous tic. Furthermore, as Turkstra hypothesized in her 2008 study, individuals would likely perform better in real life scenarios, outside of a research lab where the pressure is increased and nerves likely present.

### **Internal validity threats**

In the Cannizzaro et al. (2011) study, all of the volunteers who participated and were required to judge the communicative skills of the single participant were women. Although this may have had little effect on the overall ratings, 34 women were judging the communicative competence of another woman and gender bias cannot be ruled out (p. 557). Additionally, the volunteers consisted of 3<sup>rd</sup> and 4<sup>th</sup> year undergraduate students as well as 1<sup>st</sup> year graduate students who were not yet enrolled in their clinical practicum. Bearing this in mind, these volunteers may have little exposure to the TBI population in order to make accurate inferences and judgments regarding typical versus atypical communication.

### **External validity threats**

Within the Connizzaro et al. (2011) study, the only participant that was studied was an individual with anomia secondary to TBI. Since anomia is typically associated with more frequent gestures and unrelated non-verbal behaviors, it does not seem appropriate to generalize these findings to all individuals with traumatic brain injury (p. 550).

### **Impaired Ability to Form and Maintain Relationships**

When a life-altering event such as a traumatic brain injury occurs in one's life, the recovery back to a type of "normalcy" can take years. Aside from the medical complications, achieving one's social identity again is likely a major component of the healing process. Unfortunately, this task is not simple to achieve for this population due to the neurological damage to areas of social cognition. Several studies have examined the negative effect TBIs tend to have on Theory of Mind, or the ability to take one's perspective and therefore, predict social behavior. Aside from this, sarcasm and irony are often difficult to comprehend and use due to deficits in pragmatic abilities.

### **Theory of Mind (ToM)**

In a study of 18 individuals with TBI, researchers attempted to investigate whether the location of the lesion influenced the participant's Theory of Mind (ToM), or the ability to effectively understand other's mental states while accepting they may be different from one's own.

According to Geraci, Surian, Ferraro and Cantagallo (2010), results suggest that "TBI may result in an acquired impairment in representing and reasoning about mental states, for short Theory of Mind (p. 978)." Because of this potential impairment, these individuals have been reported as having challenges with social skills, figurative language, social isolation, affection and empathy, in addition to possessing a biased opinion of one's social interactions with others (2010, p. 978). A consensus has yet to be reached concerning the neural correlates in terms of ToM, but this study attempted to divide

participants into two groups depending on the location of the focal lesion. The two groups were divided by lesion site: ventromedial prefrontal cortex and dorsolateral prefrontal cortex. The Faux-pas Test was used on participants to assess the reasoning component of ToM, while the Reading the Mind in the Eyes Test was used to assess the perceptual aspects. Results from the present study indicated that overall, both clinical groups performed poorer than the (non-injured) control group (Geraci et al., 2010, p. 983). Additionally, “it was found that both groups performed equally poorly on the Eyes Test, but only patients with ventromedial lesions performed poorly on the Faux-pas Test (Geraci et al., 2010, p. 984).” This finding is interesting because it suggests that both areas may be associated with the perceptual aspects of ToM, while the ventromedial area shows greater influence on mental reasoning. Overall, the global severity of the individual’s injury did not appear to be the only significant factor in terms of Theory of Mind performance on the assessments. The results do, however, indicate that some of the individuals in this study possessed a deficit in inferential reasoning that was not directly correlated with impaired executive functioning skills.

### **Prediction of other’s social behavior**

Several research studies have suggested that individuals with traumatic brain injury often have impaired facial affect recognition in their communication partners. In other words, the ability to recognize other people’s emotional states is not functioning properly and can therefore limit the conversational strength between individuals. In the study by Yim et al.,

researchers sought to identify the frequency with which individuals demonstrated an impaired ability to detect emotional perception and facial affect recognition (2011, p. 279). Results indicated that nearly half (49%) of all individuals with TBI demonstrated reduced ability to recognize facial affect in their communication partners. This finding is nearly 1.1 standard deviations below the mean of the control group of healthy peers (2011, p. 281-282).

It is well known that when an individual suffers a TBI, several negative implications occur as a result, including: “Impaired empathy, poor relationships, low social participation, and high family stress (Yim et al., 2011, p. 277).” In the same study, it was discovered that individuals with TBI are more successful in recognizing positive emotional states, such as happiness and joy. In contrast, these individuals are less likely to recognize negative emotions such as anger, disgust, fear, and sadness (2011, p. 278). Interestingly, several neuroimaging techniques have been implemented to identify areas of the brain that are necessary for successfully perceiving emotional states through facial cues. These areas include, “The prefrontal, temporal, and parietal lobes, amygdala, and other structural connections to and within the limbic system, all areas commonly damaged in a TBI (Yim et al., 2011, p. 278).”

### **Detection and use of sarcasm and irony**

Evans and Hux (2011) examined the potential deficits of pragmatic communication in individuals who experienced a TBI. They used neutral facial expressions and intonation while they presented a verbal stimulus to each

participant. Results demonstrated that individuals with TBI had difficulty interpreting sarcasm, irony, and humor when given both verbal and non-verbal content. As the authors stated, “This is important because most inferential communicative acts are pragmatically ambiguous and require a listener to combine non-verbal information from facial expressions, gestures and environmental cues with verbal information to interpret a speaker’s intent (Evans & Hux, 2011, p. 678).”

### **Refuting evidence**

In the Geraci et al. study (2010), Theory of Mind was investigated in depth for two components: reasoning and perception. After researching two groups on the basis of the location of focal injury (dorsolateral versus ventromedial prefrontal cortex), ToM deficits were present. An interesting caveat, however, was that individuals were excluded from the study if they had severe executive deficits. The conclusions of this study stated that the findings “provide support for the claim that not all ToM difficulties in patients with TBI can be ascribed to weak executive functioning (Geraci et al., 2010, p. 984).” Because individuals with severe executive deficits were not included in the study, the applicability of these findings may be limited. While this finding is beneficial to researchers, further investigation is needed.

Additionally, in a study of 19 adults with traumatic brain injury investigating social cognition through conversation, it was suggested that “story- and picture-based tasks might over-estimate social inference



impairments in some individuals with TBI, as these tasks lack cues that can support social performance in everyday interactions (Turkstra, 2008, p. 406).”

### **General reflections**

Impairment in any of the above areas may severely limit one’s ability to form and maintain relationships with others. Because these impairments tend to go hand-in-hand with one another, therapeutic interventions should focus on building and maintaining social relationships bearing in mind all of the deficits that are likely to reveal themselves. It may also be beneficial to conduct a study of several individuals’ communication with his/her friends after a TBI and report on the success of the conversation where an established foundation was present prior to any accident.

### **Internal validity threats**

The sample size used in the Geraci et al. (2010) study was small, consisting of only 18 participants. The researchers were unsure whether the results were merely coincidental or of true significance. Future studies should sample a greater population and control for ceiling effects in the Theory of Mind tests (2010, p. 985).

### **External validity threats**

Individuals with severe impairments in executive functioning were not included as participants in Geraci et al. (2010) study. Therefore, the effect of executive functioning in the individuals who exhibited little or weak Theory of Mind skills cannot be generalized across all those with damage to the frontal region of the brain (2010, p. 984).

Additionally, Yim et al. (2011) study was limited to an assessment of facial affect. It is possible that individuals with TBI would perform better when analyzing vocal affect or “other forms of nonverbal affect (p. 283).” The study suggested using video scenarios in addition to static images to aid in identification of emotions conveyed during communication.

### **Future directions**

Although the research in this field is extensive, future research is warranted. The following areas should be considered in future investigations.

Due to the increasing incidence of traumatic brain injuries within the United States, it is critical that research continue to be conducted in a variety of settings, across levels of severity and gender. TBI is becoming more prevalent in women, and according to Turkstra (2008), this could be due in part to “the ageing population and higher relative number of females among older adults (p. 406).” With that said, it is suggested that future studies continue to investigate the outcomes of females as a separate research group, rather than always associated between both genders.

Additionally, it may be beneficial to take the investigations a step further and ask individuals with TBI what they would do (i.e., non-verbal actions) following a particular social situation, rather than simply recording what they may say or verbally communicate. Presenting a social scenario in a safe environment would grant researchers the ability to observe and collect data on the actions of these individuals without concern for his/her safety.

Future studies should not only control for gender, race, and severity, but also IQ. While some studies controlled for this variable, not all did. An individual's IQ can be an important determinant of success of communication.

Finally, future research would benefit from targeting specific discourse skills in TBI treatment groups, and then reanalyzing results from previous studies. After specific language skills have been retaught and perhaps reestablished in this population, it would be beneficial to measure progress and growth over time.

### **Conclusion**

Overall individuals with traumatic brain injury perform poorer on tasks of pragmatic abilities when compared to their non-injured peers. While site of lesion does influence the skills impacted, it is generally accepted that this population tends to encounter challenges in terms of social cognition. While therapy may be aimed at increasing the effectiveness of interactions between communicators, the impaired neurological areas are often times too severe to fully recover. As a result, speech-language pathologists should strive for continued progress rather than complete recovery in terms of communication, both receptively and expressively.

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