

# The Prevalence of Pragmatic Communication Impairments in Traumatic Brain Injury

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## ABSTRACT

People with TBI are frequently described as having difficulty with communication in social situations. This difficulty, often referred to as pragmatic communication impairment, can have serious consequences for survivors of brain injury. Pragmatic communication impairment has been implicated in decreased marital satisfaction, divorce, deterioration of social networks, and unemployment. Pragmatic communication impairments are particularly relevant to people with TBI who sustain their injuries as young adults – a period when individuals develop intimacy through friendships and professional and affective relationships.

While there is general agreement that the communication impairments seen in people with TBI are not adequately captured by traditional language assessments, there is no clear consensus as to what types of measures can describe them. This, combined with the fact that most research investigating communication impairments in this population employs a variety of different test measures over a relatively small number of subjects, has resulted in confusing and sometimes contradictory descriptions of the patterns of pragmatic communication impairments found in people with brain injury.

This poster presents preliminary results of pragmatic communication assessment across a large number of subjects with TBI (N = 144). Assessment is based on a rating scale of pragmatic behaviors developed for the Defense and Veterans Brain Injury Center. The scale measures nonverbal, verbal, and interactional aspects of communication. The communication sample used for these ratings includes conversation, narrative discourse, and procedural discourse. Results confirm that pragmatic communication impairments are highly prevalent in the acute phase of TBI, occurring in 86% of the present sample. Although pragmatic communication impairments occurred in nonverbal, verbal, and interactional aspects of communication, they were most prevalent in the propositional aspects as measured by cohesion, relevance to topic, level of elaboration, and initiation of topic.

## INTRODUCTION & RATIONALE

Almost all adults sustaining severe brain injuries demonstrate persisting changes in cognition, personality and/or behavior.<sup>1</sup> Changes in each of these areas have been associated with difficulty in communicating appropriately in social situations.<sup>2-4</sup> These aspects of communication fall within the domain of *pragmatics* - those rules of communication that serve to integrate verbal and nonverbal behavior to communicate appropriately in a social context.<sup>5,6</sup>

- Cognitive impairments in attention and memory may result in problems with topic maintenance that are manifested in communication that is irrelevant or tangential.
- Personality changes involving egocentric thinking with loss of social sensitivity may result in a self-centered style of communication that is lacking empathic interaction with a conversational partner.
- Behavioral changes may also affect communication. Decreased initiation may result in sparse, uninformative interactions whereas impulsivity may result in verbose, tangential communication that is marred by inappropriate remarks.

The consequences of pragmatic communication impairments in people with brain injury are devastating. Social communication serves to connect people to their families, friends, and coworkers.

- Pragmatic communication impairments have been implicated in decreased marital satisfaction<sup>7</sup> and subsequent divorce.<sup>8</sup>
- Families that remain together report gradual disintegration of their social network.<sup>9</sup>
- People with brain injury report reduced social contacts<sup>10</sup> and rate loneliness as their most frequent complaint.<sup>11</sup>
- Appropriate communication appears to be a potent predictor in the ability of brain-injured adults to successfully sustain employment.<sup>12</sup>

As Morton and Wehman<sup>13</sup> point out, this is particularly relevant for people with brain injury who generally sustain their injuries between the ages of 20 and 40 years old, “when an individual’s primary psychological task is to develop a mature capacity for intimacy through friendships and romantic relationships.”

Clearly, the effect of brain injury on an individual’s pragmatic communication is a powerful factor in that person’s outcome. This makes it imperative for rehabilitation providers to address pragmatic aspects of communication in treatment.

## ASSESSMENT OF PRAGMATIC COMMUNICATION

To successfully treat pragmatic aspects of communication in adults with brain injury, it is necessary to have an assessment tool that will reliably measure a broad range of pragmatic aspects of communication. While there is general agreement that the communication impairments seen in brain-injured adults are not adequately captured by traditional language assessments,<sup>14,15</sup> there is no clear consensus as to what types of measures can best assess these impairments. This, combined with the fact that most research investigating communication impairments in this population employs a variety of different test measures over a relatively small number of subjects, has resulted in confusing and sometimes contradictory descriptions of the patterns of pragmatic communication impairments in this population. There is a great need for the assessment of large numbers of brain-injured adults using

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a common measure of pragmatic communication that can be easily used in a clinical setting. Without this information, there can be no reliable assessment of pragmatic impairment and no reliable method for assessing changes in pragmatic aspects of communication as a function of treatment.

## DEVELOPMENT OF THE PRAGMATIC RATING SCALE

The rating scale used for this study was developed as part of the Defense & Veterans Head Injury Program. The scale was developed along three principles.

### **Principle 1:** The pragmatic evaluation should include a variety of discourse measures:

Communicative style varies from one type of discourse to another.<sup>16,17</sup> Communication samples should incorporate a variety of measures including:

- *Casual conversation* which often drifts from topic to topic and is characterized by unfinished or interrupted utterances.
- *Narrative discourse* (describing a story or event) which requires greater topic maintenance and organization of discourse than does conversation.
- *Procedural discourse* (explaining a specific procedure) which requires strong adherence to topic and places high demands on the clarity and organization of discourse.

### **Principle 2:** The pragmatic evaluation should be clinically feasible:

Many of the current assessment techniques such as cohesion analysis,<sup>16</sup> story grammar analysis,<sup>18</sup> topic analysis,<sup>19</sup> and conversational analysis,<sup>20</sup> require laborious transcription and specialized discourse analyses that are impractical in today's cost-conscious health care climate. Rating scales offer an efficient method for timely assessment of a broad range of behaviors.

### **Principle 3:** The pragmatic evaluation should be comprehensive:

The rating scale should include the full range of pragmatic behaviors. Hartley<sup>6</sup> identifies three broad areas of communication behavior relative to pragmatics:

- Nonverbal/Paralinguistic aspects of communication which include motoric aspects of communication (posture, gesture, facial expression) as well as the prosodic aspects of speech.
- Propositional aspects of communication which refer to the information conveyed by the speaker and are reflected in the relevance, clarity, and organization of the message.
- Interactional aspects of communication which relate to the reciprocal nature of communication between people that is reflected in appropriate turn-taking, ongoing feedback to communication partners, and repair of communication breakdown.

## THE COMMUNICATION SAMPLE

### **The Communication Sample:**

The communication sample takes approximately 30 minutes to elicit and typically yields a videotaped sample 15-18 minutes in length. The sample comprises following tasks:

#### **Conversation**

- Unstructured Conversation: The subject and clinician engage in 5 minutes of "free conversation" in which no set topics or questions are employed.
- Structured Conversation: The subject and clinician view a 4-minute news broadcast on "prison boot camps" and then engage in a 5 minute conversation that is constrained to this topic.

**1. Non-Verbal Aspects of Communication**

**INTELLIGIBILITY**  
(conversation)

1	2	3	4	5
Frequent distortion of words. Speech is less than 6% intelligible.	Moderate distortion of words. Speech is 36-65% intelligible.		Normal or near normal clarity of words. Speech is more than 95% intelligible.	

**FLUENCY**  
(conversation)

1	2	3	4	5
Communication is consistently characterized by incomplete utterances, false starts and cut-off words. Normal fluency occurs less than 6% of the time.	Communication is characterized by few incomplete utterances, false starts and cut-off words. Normal fluency occurs 36-65% of the time.		Normal fluency occurs more than 95% of the time.	

**PROSODY**  
(conversation)

1	2	3	4	5
Severely reduced variation of intonation and stress (appropriate less than 6% of the time).	Moderately reduced variation of intonation and stress (appropriate 36-65% of the time).		Normal variation of intonation and stress (appropriate more than 95% of the time).	

**FACIAL EXPRESSION**  
(conversation)

1	2	3	4	5
Severely reduced variation of facial expression (appropriate less than 6% of the time).	Moderately reduced variation of facial expression (appropriate 36-65% of the time).		Normal variation of facial expression (appropriate more than 95% of the time).	

**EYE CONTACT**  
(conversation)

1	2	3	4	5
Severely reduced eye contact (eye contact is appropriate less than 6% of the time).	Moderately reduced eye contact (eye contact is appropriate 36-65% of the time).		Normal adjustment of eye contact (eye contact appropriate more than 95% of the time).	

**GESTURE**  
(conversation)

1	2	3	4	5
Minimal use of gesture or unusually frequent or bizarre gestures that distract from communication. Normal use of gesture occurs less than 6% of the time.	Limited use of gesture or moderate occurrence of bizarre gestures that distract from conversation. Normal use of gesture occurs 36-65% of the time.		Normal use of gesture to support communication more than 95% of the time.	

**2. Propositional Aspects of Communication**

**COHESION**  
(all tasks)

1	2	3	4	5
Communication is consistently vague and lacks adequate information or clear referents understanding (more than 95% of the time).	Communication is moderately vague and lacks adequate information or clear referents 36-65% of the time.		Communication is consistently clear with ample information and clear referents. Lacks adequate information or clear referents less than 6% of the time.	

**TOPIC MAINTENANCE: RELEVANCE**  
(all tasks)

1	2	3	4	5
Conversation is consistently irrelevant to topic (relevant less than 6% of the time).	Conversation is moderately irrelevant to topic (relevant 36-65% of the time).		Conversation is relevant to topic (relevant more than 95% of the time).	

**TOPIC MAINTENANCE: ELABORATION**  
(all tasks)

1	2	3	4	5
Absence of topic elaboration. Produces consecutive utterances related to a given topic/ responds to communication partner's comments (without request) less than 6% of the time.	Moderately reduced topic elaboration. Produces consecutive utterances related to a given topic/ responds to communication partner's comments (without request) 36-65% of the time.		Normal elaboration of topic. Produces consecutive utterances related to a given topic/ responds to communication partner's comments (without request) more than 95% of the time.	

**QUANTITY/CONCISENESS: INITIATION**  
(conversation)

1	2	3	4	5
Severely limited initiation of new topics. Initiates new topic where appropriate less than 6% of the time.	Limited initiation of new topics. Initiates new topic where appropriate 36-65% of the time.		Normal initiation of new topics. Initiates new topic where appropriate more than 95% of the time.	

**QUANTITY/CONCISENESS (VERBOSITY)**  
(all tasks)

1	2	3	4	5
Communication is consistently characterized by excessive detail or unnecessary repetition of information (appropriate detail and repetition less than 6% of the time).	Communication is consistently characterized by moderately excessive detail or unnecessary repetition of information (appropriate detail and repetition 36-65% of the time).		Communication has appropriate amount of detail and repetition of information (more than 95% of the time).	

**THE PRAGMATIC RATING SCALE**  
(Figure 1)

**3. Interactional Aspects of Communication**

**TOPIC MANAGEMENT: APPROPRIATENESS**  
(conversation)

1	2	3	4	5
Severe impairment of the ability to select a topic for conversation that is appropriate (topic is appropriate to context less than 6% of the time).	Moderate impairment of the ability to select a topic for conversation that is appropriate (topic is appropriate to context 36-65% of the time).		Topics introduced are appropriate to situational context greater than 95% of the time.	

**TURN-TAKING (RESPONSIVENESS)**  
(conversation)

1	2	3	4	5
Severely increased response latency (normal response latency occurs less than 6% of the time).	Moderately increased response latency (normal response latency occurs 36-65% of the time).		Normal response latency (occurs more than 95% of the time).	

**TURN-TAKING (INTERRUPTION)**  
(conversation)

1	2	3	4	5
Consistent interruption of communication partner (more than 95% of the time).	Moderate interruption of communication partner (36-65% of the time).		Minimal interruption of communication partner (less than 6% of the time).	

**FEEDBACK**  
(conversation)

1	2	3	4	5
Minimal verbal or non-verbal behavior in response to communication partner (appropriate feedback occurs less than 6% of the time).	Limited verbal or non-verbal behavior in response to communication partner (appropriate feedback occurs 36-65% of the time).		Normal verbal or non-verbal behavior in response to communication partner (appropriate feedback occurs 95% of the time).	

**REPAIR**  
(conversation, referential tasks)

1	2	3	4	5
Absence of repair of conversational breakdown (repair occurs less than 6% of the time where appropriate).	Moderately reduced repair of conversational breakdown (repair occurs 36-65% of the time where appropriate).		Normal repair of conversational breakdown (repair occurs 95% of the time where appropriate).	

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## **Narrative Discourse**

- **Sundays:** The subject is instructed to, "Tell me what you usually do on Sundays." This topic has been found to elicit relatively long speech samples with reasonable variety in content in aphasic and non-brain-damaged adults.<sup>21</sup>

## **Procedural Discourse**

- **Washing Dishes:** The subject is instructed to, "Tell me how you go about doing dishes by hand." This topic has been found to be free from gender bias and to dependably elicit a similar number of steps across aphasic and non-brain-damaged adults.<sup>21</sup>
- **The Dice Game:** The clinician teaches the subject to play a simple board game and the subject describes how to play the game to a naïve listener.<sup>15</sup> This is a challenging task that assesses the subject's ability to organize and communicate a complex sequence of ideas.

## **RESEARCH QUESTIONS**

1. Can a clinically feasible pragmatic assessment (i.e. sample and analysis completion within one hour) reliably assess pragmatic communication in people with TBI?
2. How frequently do pragmatic communication impairments occur in a large sample of people with severe TBI in the acute phase of recovery?
3. Which pragmatic communication impairments occur most frequently?

## **SUBJECTS**

Pragmatic communication samples were obtained on 144 adults with TBI. All participants were either active-duty military personnel or veterans participating in the Defense & Veterans Head Injury Program. Profile of relevant variables is as follows:

- **Gender:** There were 134 male subjects and 10 female subjects included in the sample.
- **Age:** Subjects' ages ranged from 18 to 71 years with an average age of 32.8 and standard deviation of 12.9.
- **Education:** Level of education ranged from 9 to 18 years with a mean of 12.5 years and a standard deviation of 1.5 years.
- **Time Post-Onset:** The time between onset of injury and testing ranged from 3 days to 132 days with a mean of 36.2 days and a standard deviation of 31.9 days.
- **Severity:** All but one subject was classified as having a severe TBI (i.e. PTA > 24 hrs.). One participant with moderate TBI had a PTA of 1 hour. Within the sample, PTA ranged from 1 hour to 133 days with a mean of 41.2 days and a standard deviation of 28.9 days.

## **RATERS**

The first three authors served as raters for the samples. All raters were speech-language pathologists with a Certificate of Clinical Competence from the Association of Speech-Language-Hearing Association.

## **RELIABILITY**

Ten videotaped pragmatic samples were randomly selected and rated by all three raters using the pragmatic rating scale. Agreements were defined as within one scale point for each comparison. Inter-rater reliability was calculated using the formula:

$$\frac{\text{Number of Agreements}}{\text{Number of Agreements} + \text{Number of Disagreements}}$$

As can be seen in Figure 2, inter-rater reliability was at or above .8 for fifteen of the sixteen pragmatic parameters. Reliability for the remaining parameter, “appropriateness,” was .77, clearly approaching an acceptable level of reliability.

**(Figure 2) Non-verbal/Paralinguistic Aspects of Communication**

	Intelligibility	Fluency	Prosody	Facial Expression	Eye Contact	Gesture
Reliability	1.0	.8	.9	.93	.9	.97

**Propositional Aspects of Communication**

	Cohesion	Relevance	Elaboration	Initiation	Verbosity
Reliability	.97	.8	.9	1.0	.93

**Interactional Aspects of Communication**

	Appropriateness	Responsiveness	Interruption	Feedback	Repair
Reliability	.77	.97	1.0	.87	.8

## PREVALENCE OF PRAGMATIC COMMUNICATION IMPAIRMENTS IN ACQUIRED BRAIN INJURY

Designation of pragmatic communication is complicated by two problems:

1. Little is known about the range of pragmatic behaviors in the non-brain-damaged population.<sup>22</sup>
2. The little that is known suggests that there is overlap between the pragmatic profiles of people with TBI and non-brain-damaged individuals.<sup>23</sup>

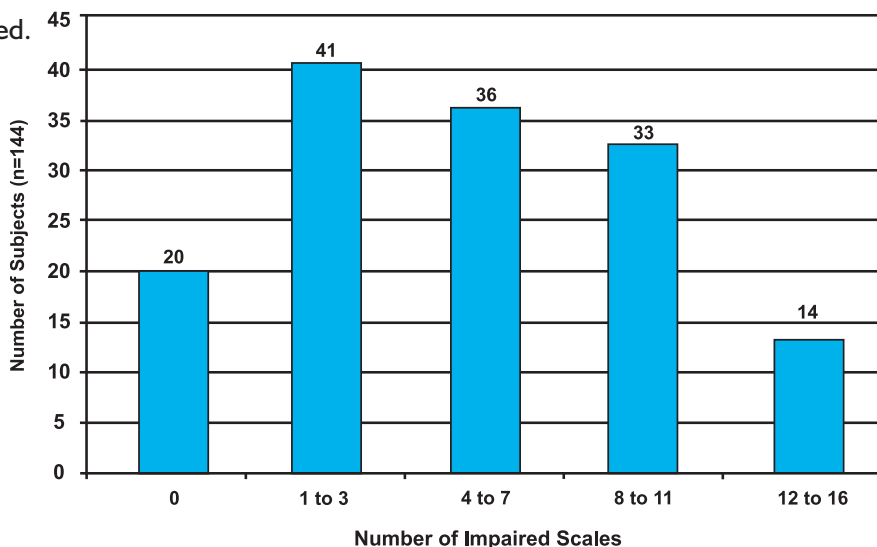
For this reason, scale values of 3 or less were designated as impaired for this analysis.

### Prevalence of Pragmatic Impairments in the TBI Sample:

The number of pragmatic parameters identified as impaired for a specific subject ranged from 0 to 15 of the 16 total pragmatic parameters (see figure 3).

- In 20 participants (14% of the sample) no pragmatic impairments were identified.
- In 41 subjects (28% of the sample) pragmatic communication impairments were identified in 6-25% of the pragmatic behaviors (1-3 behaviors).
- In 36 subjects (25% of the sample) pragmatic communication impairments were identified in 25-50% of the pragmatic behaviors (4-7 behaviors).
- In 33 subjects (23% of the sample) pragmatic communication impairments were identified in 50-75% of the pragmatic behaviors (8-11 behaviors).
- In 14 subjects (10% of the sample) pragmatic communication impairments were identified in > 75% of the pragmatic behaviors (> 11 behaviors).

Figure 3. Total Number of Impaired Scales by Subject

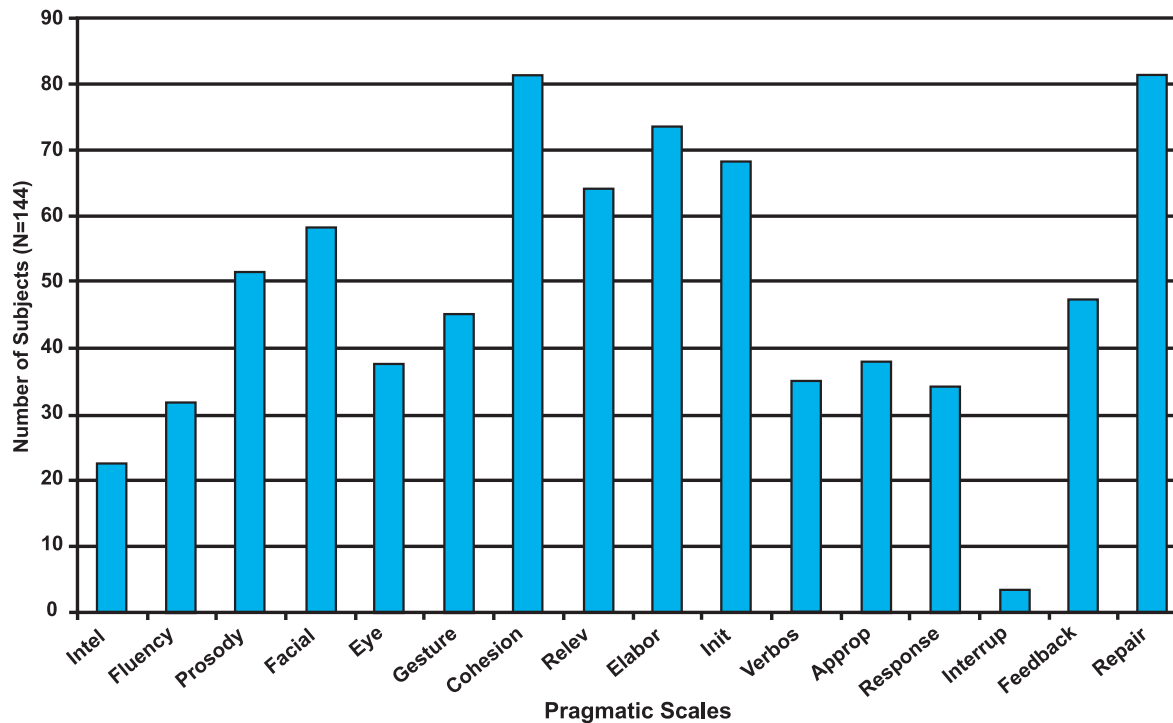


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## Prevalence of Impairment of Specific Pragmatic Behaviors within the Sample:

- Pragmatic impairments occurred across all three aspects of pragmatic communication: nonverbal/paralinguistic, propositional, and interactional.
- Frequency of impairment ranged from 3 participants for “interruption” to 81 participants each for “cohesion” and “repair.”
- The five scales with the highest frequency of impairment included: “cohesion,” “repair,” “elaboration,” “initiation,” and “relevance.”

Figure 4. Frequency of Impairments by Scale



## CONCLUSIONS

1. Pragmatic communication can be reliably measured using clinically feasible procedures.
2. Pragmatic communication impairments are highly prevalent in the acute phase of TBI, occurring in 86% of the study sample.
3. The majority of pragmatic communication impairments involve propositional aspects of the message related to the formulation, relevance, and clarity of the message. This cluster of impairments may reflect the effects of fragmented cognitive processes on language processing.
4. However, pragmatic communication impairments did occur in all aspects of communication indicating that assessment and treatment should address nonverbal/paralinguistic and interactional aspects of communication as well.

## FUTURE RESEARCH

1. Normative data on the pragmatic communication of non-brain-damaged individuals are sorely needed to identify the degree of overlap with the brain-injured population and improve the confidence with which pragmatic impairments can be identified. We plan to assess the pragmatic communication of a group of non-brain-damaged individuals matched to the present sample for age and education to serve as a comparison group for the present sample.
2. Test-retest data are needed on non-brain-damaged controls and subjects with chronic brain injury to establish the stability of the communication sample.
3. Intra-rater reliability needs to be established to determine the extent to which rater “drift” may interfere with the consistency of ratings.<sup>24,25</sup>
4. Research is needed to determine which pragmatic behaviors have the greatest impact on the adequacy of social communication. Efficiency of treatment can then be enhanced by treating those behaviors that will have the greatest impact on improving social communication.

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