

Examining Linguistic Narratives and Symptoms of Anxiety, PTSD, and Depression

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Introduction

Goal:

In the present study, we explored the relationships between cognitive processing styles, psychological symptom measures (anxiety, PTSD, and depression), and linguistic patterns as identified by the Linguistic Inquiry and Word Count (LIWC-22) tool. Our aim was to enhance the understanding of how processing styles and linguistic features correlate with psychological symptomatology.

Cognitive Processing Style: a person's characteristic mode of perceiving, thinking, remembering, and problem-solving. There are three processing styles:

- Accommodation:** Accurately altering previously held beliefs based on new factual information.
- Overaccommodation:** Inaccurately altering beliefs based on overgeneralized information.
- Assimilation:** The belief is held so firmly that the person alters the event to fit the belief.

Research Questions:

1. Processing Styles Hypothesis:

- Positive correlation:
 - Assimilation & PTSD.
 - Overaccommodation & PTSD.
- Potential Similarities:
 - PTSD-related processing styles may also apply to anxiety, considering PTSD's classification as an anxiety disorder.
 - Possible similarities in processing styles between PTSD and depression due to their comorbidity, despite limited literature on depression and processing styles.

2. Anxiety Hypothesis:

- Positive correlation: First-person personal pronouns ("I") & anxiety symptoms.
- Negative correlation: First-person plural pronouns ("we") & anxiety symptoms.
- Positive correlation: Negative emotion words & anxiety symptoms.

3. PTSD Hypothesis:

- Similar to anxiety:
 - Positive correlation: First-person personal pronouns & PTSD symptoms.
 - Negative correlation: First-person plural pronouns & PTSD symptoms.
- Additional correlations:
 - Positive correlation: Cognition words, negative emotion words, sensory words & PTSD symptoms.
 - Negative correlation: Word count & PTSD symptom severity.

4. Depression Hypothesis:

- Positive correlation: First-person personal pronouns & depression symptoms.
- Negative correlation:
 - First-person plural pronouns & depression symptoms.
 - Positive words & depression symptoms.
- Positive correlation: Cognition words, negative emotion words & depression symptoms.

Methods

Participants:

•149 students from RIT (average age 19.38; SD = 1.292).

Materials:

- Narrative Prompt: Participants described their thoughts and feelings about a personal or observed adverse event.
- Brief Post Traumatic Cognitions Inventory (PTCI-9; Wells et al., 2017): Assessed negative self and environmental perceptions.
- State-Trait Anxiety Inventory (STAI; Spielberger, 1983): Evaluated current and typical anxiety levels.
- Positive and Negative Affect Schedule (PANAS; Watson et al., 1988): Measured current emotional states.
- Beck's Depression Inventory (BDI-II; Beck et al., 1996): Assessed depressive symptom prevalence.
- Life Events Checklist (LEC; Sweeting and West, 1994): Quantified adverse experiences diversity.
- Linguistic Inquiry and Word Count (LIWC-22; Boyd et al., 2022): Analyzed textual content for specific word categories.

Procedure:

- Process: Informed consent, narrative prompt, demographic questionnaire, completion of PTCI-9, STAI, PANAS, BDI-II, and LEC.
- Debriefing: Provided study objectives, hypotheses, and contact information.

Results

Narrative responses were coded by trained annotators using the Impact Statement Coding manual (Sobel et al., 2009). Fleiss Kappa confirmed inter-rater reliability ($\kappa = 0.79, p < 0.001$).

H1: Processing Styles

	Accommodation	Overaccommodation	Assimilation	Negative Self	Negative World	Self Blame	STAI STATE	STAI TRAIT	PANAS	BDI
Accommodation Pearson Correlation										
Overaccommodation Pearson Correlation	0.081									
Assimilation Pearson Correlation	-0.191	-0.091								
Negative Self Pearson Correlation	-0.131	0.367	0.046							
Negative World Pearson Correlation	-0.115	0.126	-0.166	0.421						
Self Blame Pearson Correlation	0.057	0.199	-0.005	0.464	0.164					
STAI STATE Pearson Correlation	0.052	0.244	0.086	0.512	0.293	0.345				
STAI TRAIT Pearson Correlation	0.011	0.266	-0.011	0.541	0.321	0.381	0.701			
PANAS Pearson Correlation	-0.047	-0.298	-0.044	-0.546	-0.336	-0.367	-0.763	-0.781		
BDI Pearson Correlation	-0.044	-0.291	0.037	0.637	0.396	0.343	0.707	0.773	-0.752	

*. Correlation is significant at the 0.05 level (2-tailed).
**. Correlation is significant at the 0.01 level (2-tailed).

Figure 1. Correlation matrix between cognitive processing styles and measures.

H2: Anxiety

	STAI STATE	STAI TRAIT	i	we	ppron	Affect	cause	feeling	time
STAI STATE Pearson Correlation									
STAI TRAIT Pearson Correlation	0.781								
i Pearson Correlation	0.159	0.193							
we Pearson Correlation	0.030	-0.042	-0.115						
ppron Pearson Correlation	0.106	0.105	0.752	0.115					
Affect Pearson Correlation	0.086	0.176	0.008	-0.181	-0.061				
cause Pearson Correlation	0.164	0.207	0.020	-0.120	-0.097	0.155			
feeling Pearson Correlation	0.077	0.137	0.147	-0.146	-0.048	0.287	0.280		
time Pearson Correlation	-0.137	-0.219	0.077	0.102	0.107	-0.231	-0.436	-0.162	

**. Correlation is significant at the 0.01 level (2-tailed).
*. Correlation is significant at the 0.05 level (2-tailed).

Figure 2. Correlation matrix between STAI and linguistic features "I," "we," "personal pronouns," "affect words," "cause words," "feeling words," and "words related to time."

H3: PTSD

	Negative Self	Negative World	Self Blame	i	we	ppron	Affect	cause	feeling	time
Negative Self Pearson Correlation										
Negative World Pearson Correlation	0.421									
Self Blame Pearson Correlation	0.464	0.164								
i Pearson Correlation	0.158	-0.022	0.284							
we Pearson Correlation	0.027	0.013	-0.053	-0.115						
ppron Pearson Correlation	0.160	-0.003	0.226	0.752	0.115					
Affect Pearson Correlation	0.143	0.145	0.137	0.008	-0.181	-0.061				
cause Pearson Correlation	0.116	0.063	0.040	0.020	-0.120	-0.097	0.155			
feeling Pearson Correlation	0.186	0.052	0.185	0.147	-0.146	-0.048	0.287	0.280		
time Pearson Correlation	-0.185	-0.140	0.150	0.077	0.102	0.107	-0.231	-0.436	-0.162	

**. Correlation is significant at the 0.01 level (2-tailed).
*. Correlation is significant at the 0.05 level (2-tailed).

Figure 3. Correlation matrix between the PTCI-9 and linguistic features "I," "we," "personal pronouns," "affect words," "cause words," "feeling words," and "words related to time."

H4: Depression

	BDI	i	we	ppron	Affect	cause	feeling	time
BDI Pearson Correlation								
i Pearson Correlation	0.203							
we Pearson Correlation	0.074	-0.115						
ppron Pearson Correlation	0.201	0.752	0.115					
Affect Pearson Correlation	0.078	0.008	-0.181	-0.061				
cause Pearson Correlation	0.238	0.020	-0.120	-0.097	0.155			
feeling Pearson Correlation	0.168	0.147	-0.146	-0.048	0.287	0.280		
time Pearson Correlation	-0.202	0.077	0.102	0.107	-0.231	-0.436	-0.162	

*. Correlation is significant at the 0.05 level (2-tailed).
**. Correlation is significant at the 0.01 level (2-tailed).

Figure 4. Correlation matrix between the BDI and linguistic features "I," "we," "personal pronouns," "affect words," "cause words," "feeling words," and "words related to time."

Discussion and Conclusion

Measures:

•Our measures of anxiety, depression, and PTSD were highly correlated with one another.

•All sub measures of the PTCI- 9 were positively correlated with each other highlighting a link between a negative self-view, negative world view and self-blame.

•The PANAS was negatively correlated with all sub measures of the PTCI-9, the STAI, and the BDI-II, meaning lower symptoms of PTSD, anxiety and depression lead to a better mood.

LIWC-22 FEATURE	DESCRIPTION	EXAMPLES
I	The word "I" to refer to the self	I
We	The word "we," first person plural pronoun	We
Personal Pronouns	All personal pronouns	I, We, he, she, they, them
Affect	Refers to mood	depressed, proud
Cause	Words that indicate the cause of an event	intend, result, responsible
Feeling	Describes emotional feeling	hurt, numb, tense
Time	Any temporal reference	A specific date, always, before, brief

Table 1. LIWC-22 features that were analyzed with the measures and processing styles. The table shows the description and examples.

H1 – Processing Style:

- Accommodation and Assimilation are negatively correlated with each other.
- Accommodation is a balanced view that changes one's schema based on new factual information, and assimilation is a rigid view that does not alter the schema based on new information but alters the perception of the event itself to fit the schema.
- Overaccommodation is positively correlated with the negative self and self-blame sub-measures of the PTCI.
- Those with an overaccommodating processing style have a negative view of themselves and overestimate their responsibility in the cause of an event.
- Overaccommodation was positively correlated with the STAI and the BDI-II
- Higher levels of anxiety and depression are linked to an all-or-nothing type of thought process.
- Assimilation was positively correlated with the negative world sub-measure of the PTCI-9. This is consistent with a violation of the just world belief, which is the belief that good things happen to good people and bad things happen to bad people (Dondanville et al.,2016). When the just world belief is violated, a person might view the world as negative to fit their schema rather than change their current belief.

H2 – Anxiety

- The STAI – Trait score is positively correlated with the use of "I" in narratives, as seen in previous literature. This supports the hypothesis that higher levels of anxiety are linked to the increased use of first-person personal pronouns.
- The STAI- Trait score was positively correlated with "affect" words, meaning that individuals with higher levels of anxiety use more mood and emotion words when describing events.
- The STAI – Trait score was negatively correlated with "time" words, meaning individuals with higher levels of anxiety made fewer temporal references.
- The STAI – State score was positively correlated with "cause" words, which could indicate a feeling of guilt linked to higher levels of anxiety.

H3 – PTSD

- Self-blame was positively correlated with the use of "I" in the narratives.
- PTSD is often associated with the processing style assimilation in this type of work, and hindsight bias is a large part of that processing style. The language used in the narratives may be similar to "if I only...then the (event/outcome) would be different."
- The negative self and self-blame sub-measures of the PTCI-9 were positively correlated with "feeling" words. Individuals with higher levels of PTSD used more words related to how the event made them feel emotionally, supporting the negative emotional content part of our hypothesis.
- The negative-self sub-measure of the PTCI-9 was negatively correlated with "time" words, supporting previous research stating that those with higher PTSD symptoms have less of a steady temporal record of events.

H4 – Depression

- The BDI-II was positively correlated with the use of "I" in the narratives, supporting our hypothesis that increased levels of depression will be associated with an increased use of first-person personal pronouns.
- The BDI-II was positively correlated with the use of "cause" words, which might indicate a link between depression symptoms and feelings of guilt.
- The BDI-II was positively correlated with "feeling" words, supporting the hypothesis that individuals with higher levels of depression will use more negative emotion words.
- The BDI-II was negatively associated with "time" words, meaning those with higher levels of depression made less temporal references, which could be due to the comorbidity with PTSD.