NEUROPSYCHOLOGICAL CONCOMITTANTS OF TBI AND PTSD IN A LARGE MILITARY SAMPLE

Antonio E. Puente

University of North Carolina Wilmington

Naval Hospital, Camp Lejeune

10.22.14

UNCΨ NEUROPSYCHOLOGY LAB

UNCW Neuropsychology Laboratory

John Capps
Aaron Dedmon
Maria DeGraba
George Dion Daniels
Michael Francis
Hana Kubabara
Andrea Mejia
Zara Meliakan
Angela Sekely
Jacob Wisnoski

Griffin Sutton
Veronica PortilloReyes

The Story of Clinic to Lab and Back to Clinic

What does Tricare have to do with neuropsychological research?

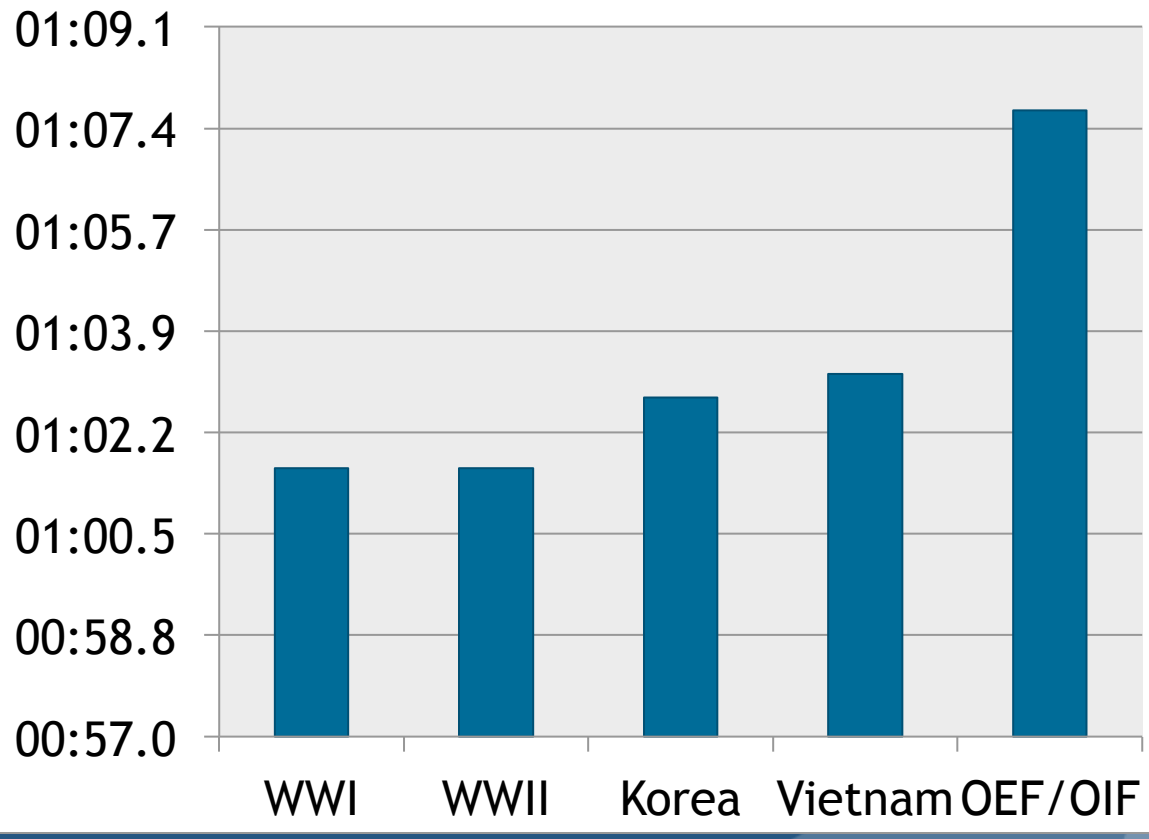
Comparison of Major US Military Operations

WWI/WWII
- 1:1

Korean War
- 1:3

Vietnam
- 1:3

OEF/OIF
- 1:7



(Tanielian and Jaycox, 2008).

Frequencies of injuries of OEF/OIF Soldiers

	Injuries	
War	Thoracic	Head
WWII	14%	21%
Vietnam	13%	16%
OEF/OIF	6%	30%

OEF/OIF

88% of TBI involve exposure to Blast

60% of soldiers injured by explosion have a TBI (44% Mild, 56% Moderate/Severe)

	Mechanism of injury	
War	Gunshot wounds	Explosion related
WWII	27%	73%
Vietnam	35%	65%
OEF/OIF	19%	81%

(Taber and Hurley, 2010)

Factors Influencing Increases

Technological Advancements

- Medical
- Armor
- Equipment

Enemy Tactics

- Nontraditional warfare
  - Increase use of Improvised Explosive Devices (IED)

(Tanielian and Jaycox, 2008). (Meyerle & Malkasian, 2009)

Measuring Impairments and Neuropsychological Change in Veterans Following Traumatic Brain Injury

-John Capps

Introduction:

Pragmatics of Measuring Change

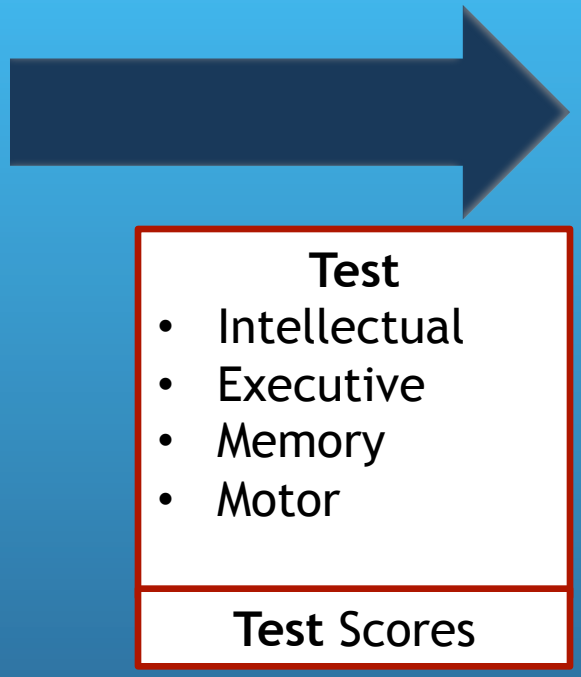
1. How do we decide if cognition functioning changed as a function of some intervention or time?

2. How do we decide if someone has significantly improved or declined?

3. How do we correct for errors in measurement with repeated testing?

Introduction:

Neuropsychological assessment



Scores provide a snap shot of cognitive functioning

Confidence intervals establish values above and below score to consider measurement error

Introduction:

Neuropsychological assessment

Test
- Intellectual
- Executive
- Memory
- Motor

Test Scores

Retest
- Intellectual
- Executive
- Memory
- Motor

Retest Scores

When individuals are tested more than once, how do we account for measurement error?

Retest Scores – **Test** Scores = Change?

Accounting for measurement error- Reliable Change Index (RCI)

Jacobson (1984)

- Significant change post epileptic surgery

Christensen and Mendoza(1986)

- Modified to include SED

$$\frac{\text{Retest Score} - \text{Test Score}}{\text{Standard Error of Difference (SED)}} = \text{Reliable Change Index (RCI) Score}$$

$$\text{Standard Error of Difference (SED)} = \sqrt{(2*(\text{Standard Error of Measurement (SEM)})^2)}$$

$$\text{Standard Error of Measurement (SEM)} = SD\sqrt{(1-r)}$$

Test publishers' Manuals

- Normed Standard deviation=*SD*
- Test-retest correlation coefficient=*r*

Accounting for Practice Effects and RCI

Mean **Retest** Scores − Mean **Test** Scores = Mean Change

Mean change
- Corrects for group wide data change

$$\frac{(\text{Retest Score} - \text{Test Score}) - \text{Mean Change}}{\text{Standard Error of Difference (SED)}} = \text{Reliable Change Index Score}$$

Establishes 95% confidence interval around both scores and detects significant change

>1.96 = Significant increase

<-1.96= Significant decrease

(Chelune et al., 1993)

Purpose:

1. Understand the changes of symptoms and neuropsychological performance in our dataset.

2. Are the common symptoms that are seen in research (Headaches, Sleep dysfunction) seen within our dataset? Are they common and persistent?

3. What is the frequency of individuals who's scores on neuropsychological are impaired, compared to clinical normative data, at initial evaluation, second evaluation, and at both initial and second evaluations.

4. What is the frequency of individuals experiencing significant clinical change from initial to second evaluation?

Results:

Injury Profile

Common Self-reported Profile

- Referred for blast exposure
- Deployed to Iraq
- Multiple blasts and IED implicated in injury
- Loss of consciousness (LOC) occurred with injury

Reported LOC

	N	Percent
Yes	55	48.2%
No	41	36%
Not specified	18	15.8%

Location Deployed

	N	Percent
Iraq	73	64%
Home Station	16	14%
Iraq/Afghanistan	9	7.9%
Not specified	9	7.9%
Afghanistan	7	6.1%

Reason Referred

	N	Percent
Blast	84	73.7%
Head Injury	13	11.4%
MVA	10	8.8%
Cognitive Testing	3	2.6%
Blast and MVA	2	1.8%
Blast and other	1	0.8%
Blunt Force Trauma	1	0.9%

Reported Injury Type

	N	Percent
Multiple Blast Types	25	21.9%
IED Mounted	23	20.2%
IED Dismounted	11	9.6%
MVA	10	8.8%
Not specified	8	7%
IED Mounted /Dismounted	7	6.1%
BFT	6	5.3%
Fall	3	2.6%

Results:

Reported symptoms at initial evaluation

	Yes	No	Not Specified
Headaches	88%	10%	2%
Sleep dysfunction	83%	15%	2%

Reported change in symptoms at second evaluation

	Consistent	New onset	Resolved
Headaches	84%	<1%	3%
Sleep dysfunction	78%	<1%	4%

Results:

Frequency of the sample with Impairments (>1 SDs) at test and retest

COWAT

Letter Fluency
- 19%

Semantic Fluency
- 16%

CVLT-II

Trials 1-5
- 16%

Grooved Pegboard

Dominant Hand
- 36%

Non-dominant Hand
- 32%

Results:

Frequency of sample with Impairments (>1 SDs) at test and retest

WAIS-III

Full Scale IQ
- 0%

Verbal Comprehension
- 8%

Working Memory
- 11%

Processing Speed
- 26%

WAIS-IV

Full Scale IQ
- 15%

- Verbal Comprehension
  - 19%
- Perceptual Reasoning
  - 15%
- Working Memory
  - 12%
- Processing Speed
  - 25%

Results:

Frequency of sample with Impairments (>1 SDs) at test and retest

WMS-III

Immediate Memory
- 14%

General Memory
- 21%

Working Memory
- 0%

WMS-IV

Auditory Memory
- 25%

Visual Memory
- 19%

Visual Working Memory
- 13%

Immediate Memory
- 20%

Delayed Memory
- 20%

Results:

Measures with Highest Frequencies of Impairment

WAIS-III
- -Processing Speed (26%)

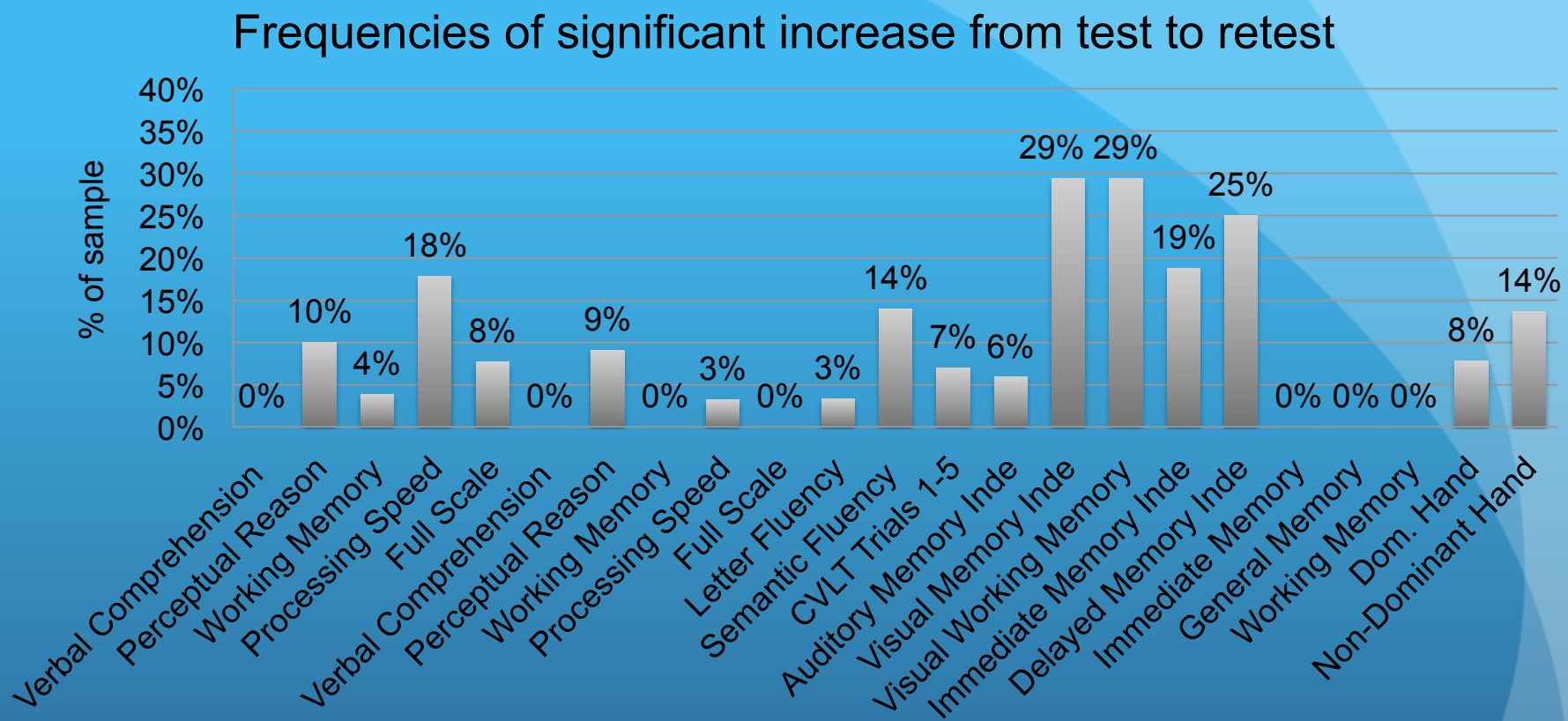
WAIS-IV
- -Processing Speed (25%)

WMS-III
- -General Memory (25%)

WMS-IV
- -Auditory Memory (25%)
- -Immediate Memory (20%)
- -Delayed Memory (20%)

Grooved Pegboard
- -Dominant Hand (36%)
- -Non-dominant Hand (32%)

Results:



<u>COWAT</u>
Letter (3%)
Semantic (14%)

<u>CVLT-II</u>
Trials 1-5 (7%)

<u>Grooved Peg Board</u>
Dominant (8%)
Non-dominant (14%)

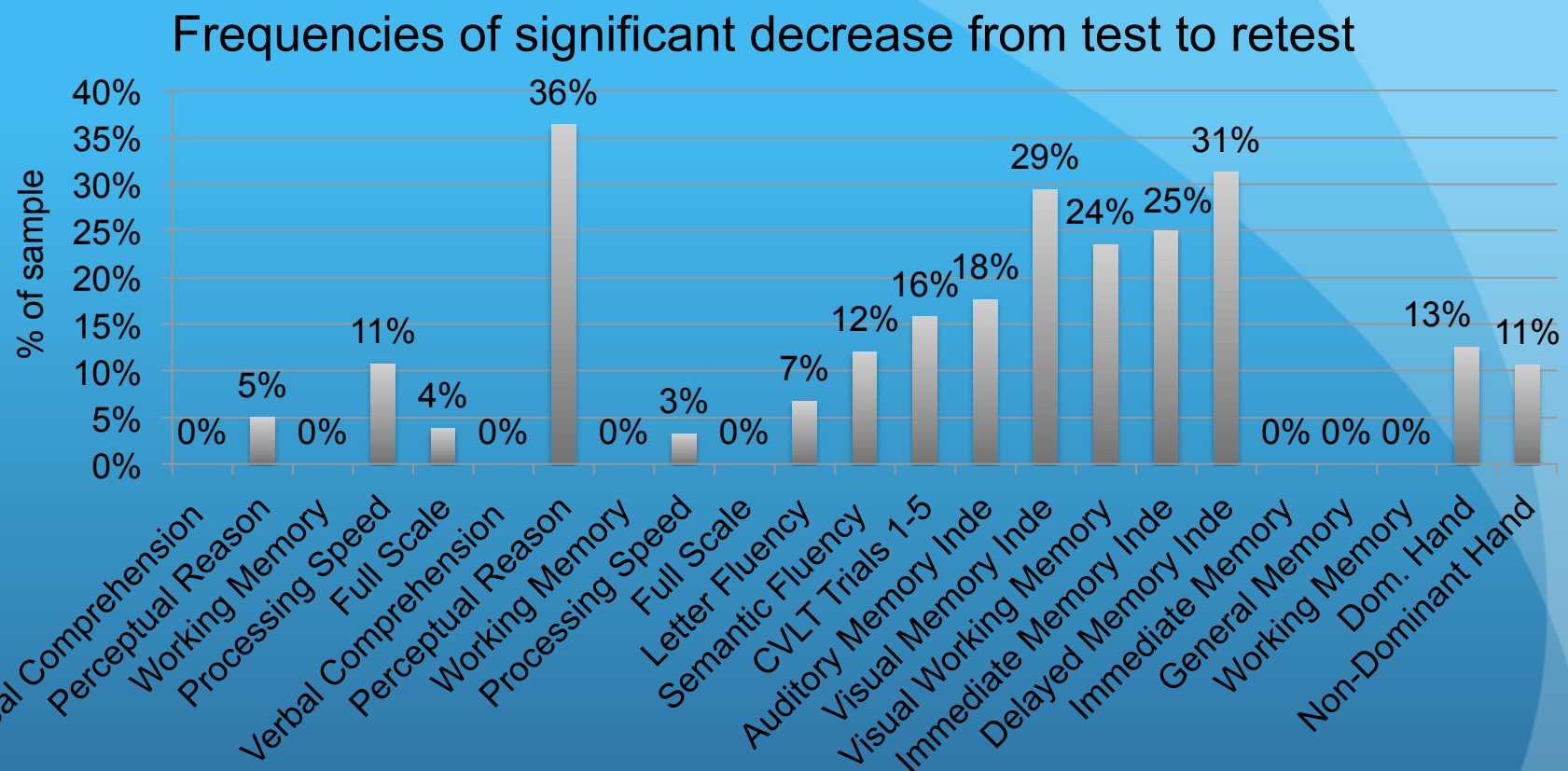
<u>WAIS-III</u>
FSIQ (0%)
VCI (0%)
POI (9%)
WMI (0%)
PSI (3%)

<u>WAIS-IV</u>
FSIQ (8%)
VCI (0%)
PRI (10%)
WMI (4%)
PSI (18%)

<u>WMS-III</u>
IMI (0%)
GMI (0%)
WMI (0%)

<u>WMS-IV</u>
AMI (6%)
VMI (29%)
VWMI (29%)
IMI (19%)
DMI (25%)

Results:



<u>COWAT</u>
Letter (7%)
Semantic (12%)

<u>CVLT-II</u>
Trials 1-5 (16%)

<u>Grooved Peg Board</u>
Dominant (13%)
Non-dominant (11%)

<u>WAIS-III</u>
FSIQ (0%)
VCI (0%)
POI (36%)
WMI (0%)
PSI (3%)

<u>WAIS-IV</u>
FSIQ (8%)
VCI (0%)
PRI (10%)
WMI (4%)
PSI (18%)

<u>WMS-III</u>
IMI (0%)
GMI (0%)
WMI (0%)

<u>WMS-IV</u>
AMI (18%)
VMI (29%)
VWMI (24%)
IMI (25%)
DMI (31%)

Summary:

Current Study indicates;

- The frequency of individuals whom are impaired are greatest in those indicated by current research
  - Processing speed, memory, motor functioning
- Headaches and sleep disturbances are common and persistent
- Our sample shows that from initial assessment to second assessment some individuals are increasing and some are decreasing, supporting current views of change being highly individualized. However some trends did appear;

  Increased;

  Processing Speed WAIS-IV: PSI (18%)

  Memory WMS-IV: VMI (29%),VWMI (29%), IMI (19%), and DMI (25%)

  Decreased;

  Processing Speed WAIS-IV: PSI (18%)

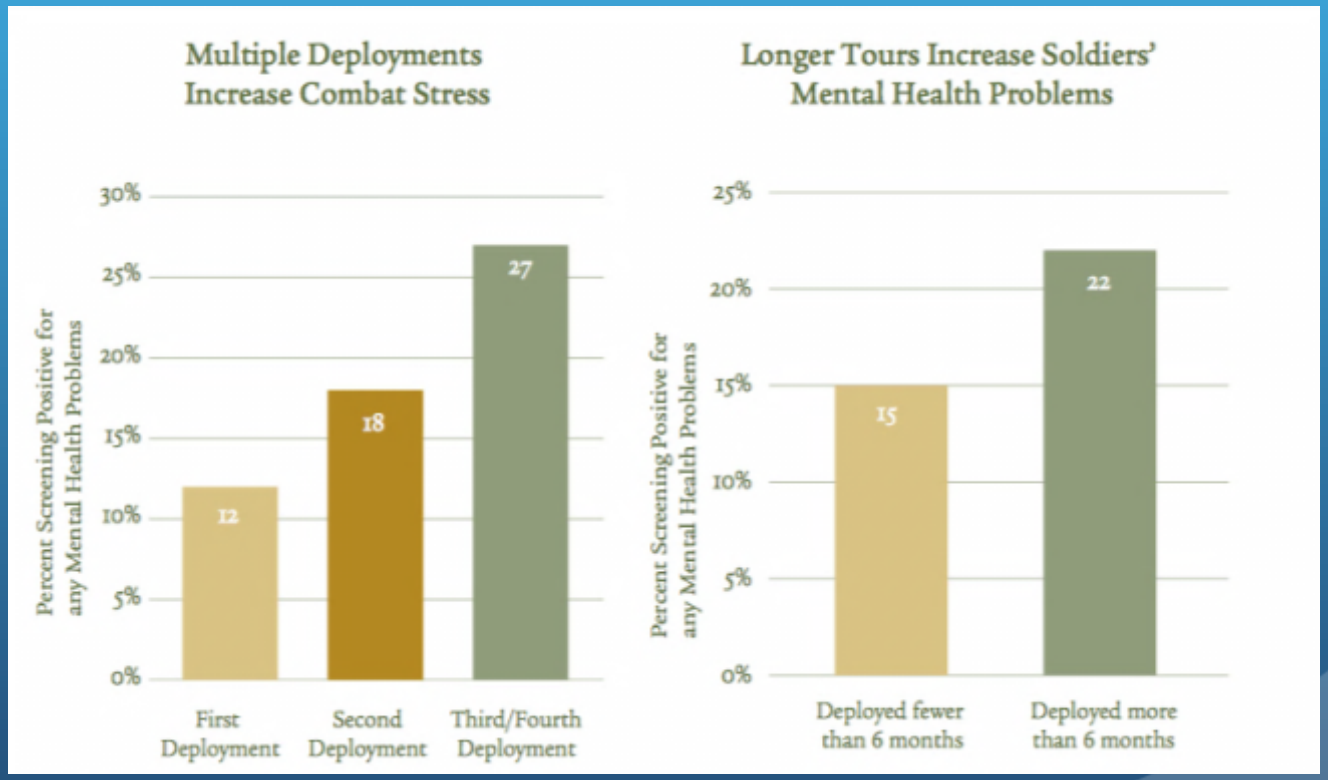
  Memory WMS-IV: AMI (18%), VMI (29%), VWMI (24%), IMI (25%), DMI (31%)

Assessing the validity of the trauma symptom inventory on military patients with post-traumatic stress disorder

Angela Sekely

PTSD in the Military

The Effects on Mental Health by Frequency and Duration of Deployments



(Mental Health Advisory Team (MHAT) V, 2008)

PTSD in the Military

PTSD has been referred to as one of the "**signature injuries**" of those returning from OEF/OIF

(Marx, 2009)

Compensation for PTSD

- Increased between 1999 and 2004 by almost 80% (from 120,265 cases to 215,871 cases) (Department of Veterans Affairs, 2005)
- 1,965 military personnel in the OIF/OEF were screened for PTSD (Marx, 2009)
  - 14% screened positively
- Payments increased from $1.7 billion to $4.3 billion (Department of Veterans Affairs, 2005)

Compensation for PTSD

- Both the physical and mental health needs of today's veterans will be greater than what has previously been seen in military conflicts
- Modern screening and treatment for PTSD provides the opportunity to respond quickly and effectively to this mental health crisis among veterans, but is not being put into place
  - Estimated that the cost of psychological injuries could decrease by 27% (Tanielian & Jaycox, 2008)

The Trauma Symptom Inventory (TSI)

- 100-item, structured, self-report measure that is designed to assess one's psychological functioning after experiencing a traumatic event
- Emotion Based Neuropsychological Assessment
- The TSI is comprised of ten clinical scales and three validity scales

TSI Scales

- Ten clinical scales
  - Anxious Arousal (AA)
  - Depression (D)
  - Anger/Irritability (AI)
  - Intrusive Experiences (IE)
  - Defensive Avoidance (DA)
  - Dissociation (DIS)
  - Sexual Concerns (SC)
  - Dysfunctional Sexual Behavior (DSB)
  - Impaired Self Reference (ISR)
  - Tension Reduction Behavior (TRB)
- Three validity scales
  - Response Level (RL)
  - Atypical Response (ATR)
  - Inconsistent Response (INC)

★Raw scores are obtained for each scale and then are converted into T scores according to age and gender

The ATR Scale

- The ATR Scale is designed to assess when an individual over reports symptoms that are unusual
- *T* scores of 70-90 are considered as suspicious of malingering
- *T* scores of 90 or above are considered as invalid

MMPI-2

- Ten clinical scales
  - Hypochondriasis (Hs)
  - Depression (D)
  - Hysteria (Hy)
  - Psychopathic Deviate (Pd)
  - Masculinity-Femininity (Mf)
  - Paranoia (Pa)
  - Psychasthenia (Pt)
  - Schizophrenia (Sc)
  - Hypomania (Ma)
  - Social Introversion (Si)
- Four validity scales
  - Cannot-Say (?)
  - Lie (L)
  - Defensiveness (K)
  - Infrequency (F)

The F Scale

- The F scale was developed to detect deviant or atypical ways of responding, or to discover false claims for those reporting PTSD and seeking compensation
- High scores can be due to three things
  - Severe psychopathology
  - An individual seeking to appear worse off than he or she actually is
  - Difficulty completing the inventory due to issues such as reading problems or carelessness

TOMM

- It is a 50 item recognition task that is composed of two learning trials and one retention trial (TOMM1, TOMM2, and TOMMR)
- Scores below 45 raise the concern that the individual is not putting forth maximal effort
- The purpose is to help determine if the performance on tests of neurocognitive functioning accurately reflects an individual's abilities

Present Study

The purpose of this study was to discover whether different tests of effort measure the same thing, especially when some of these tests appear to be measuring cognitive domains (e.g. TOMM), and other tests appear to be measuring emotional domains (e.g. MMPI-2 and TSI)

Participants

A large, existing database of 1,361 Marines and Sailors from Camp Lejeune, North Carolina

Participants

- Initial inclusion criteria for entry in the study included:
  - Completed at least 6/12 neuropsychological tests
  - Had verification of active or limited duty status
  - Had verification of injury
  - Completed both clinical interviews and a follow up session

1361
-350
1011

Participants

- 120 individuals were removed due to repeated testing
- 156 individuals were removed due suboptimal performance

1011
- 120
- 156
735

Participants

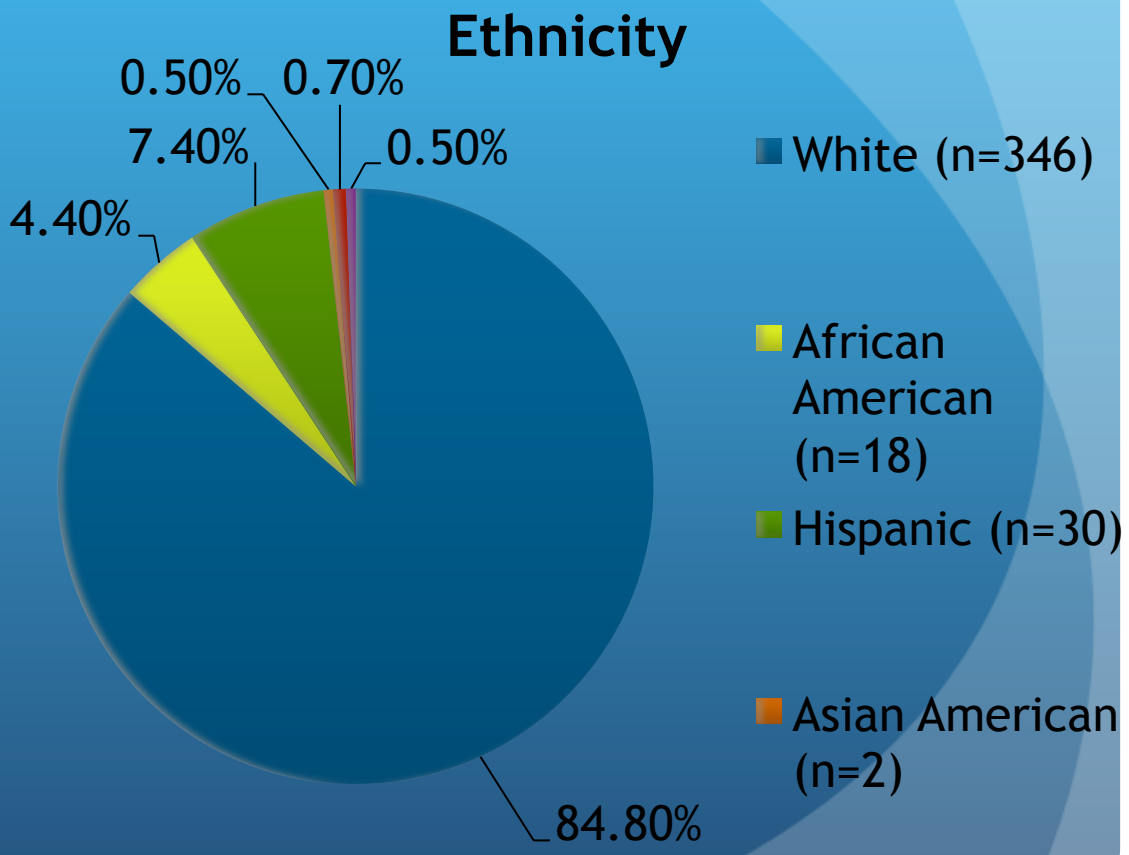
- Having accurately completed the TOMM, the TSI, and the MMPI-2
  - 444 scores on the TSI
  - 713 scores on the MMPI-2
  - 698 scores on the TOMM Trial 1 (TOMM1)
  - 699 scores on the TOMM Trial 2 (TOMM2)
  - 688 scores on the TOMM Retention Trial (TOMMR)

735
-327
408

Participants

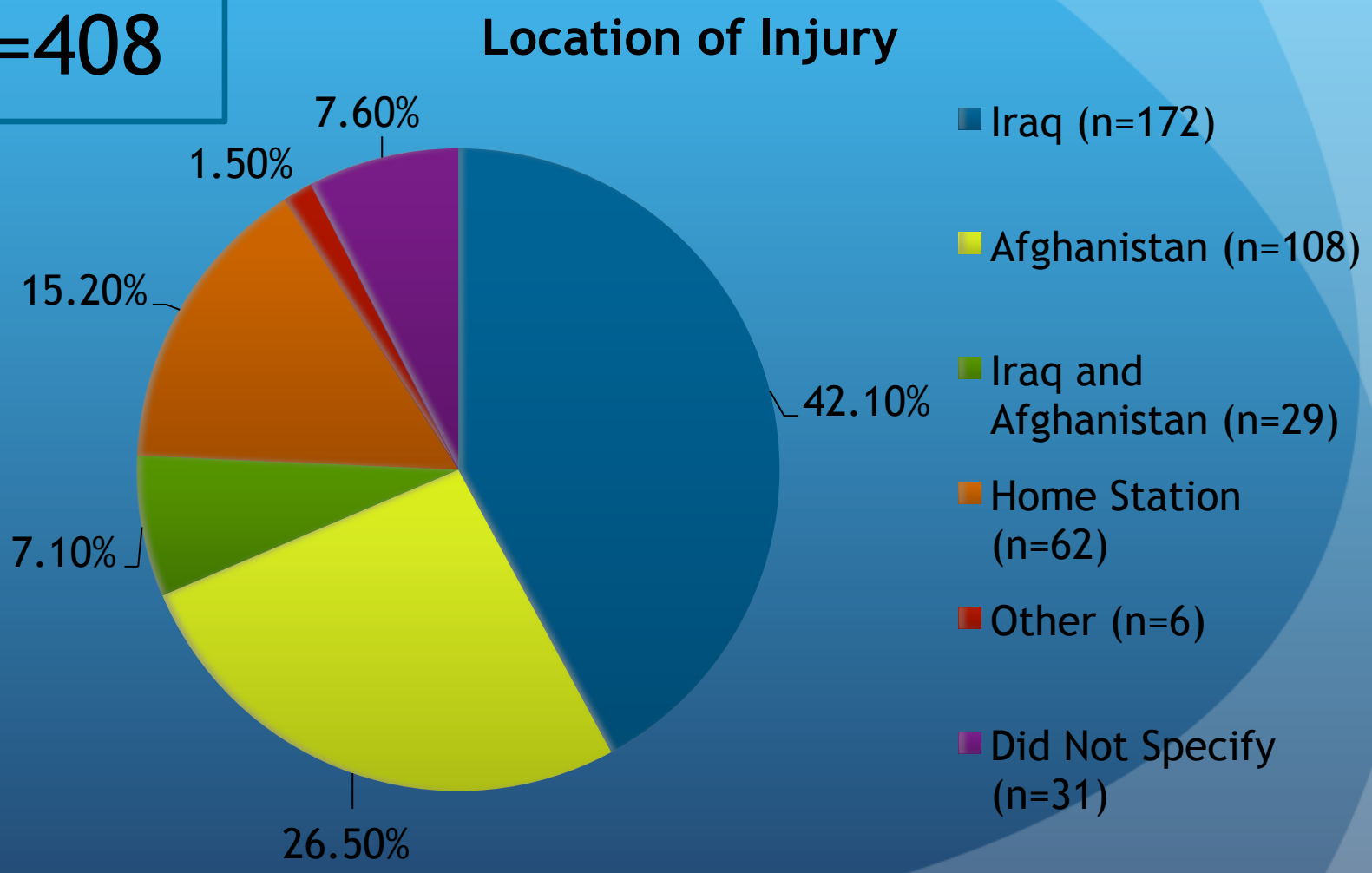
N=408

- Age:
  - 18-52 (*M*= 25.78)
- Gender:
  - 407 (99.8%) Males
  - 1 (0.2%) Females



Participants

N=408

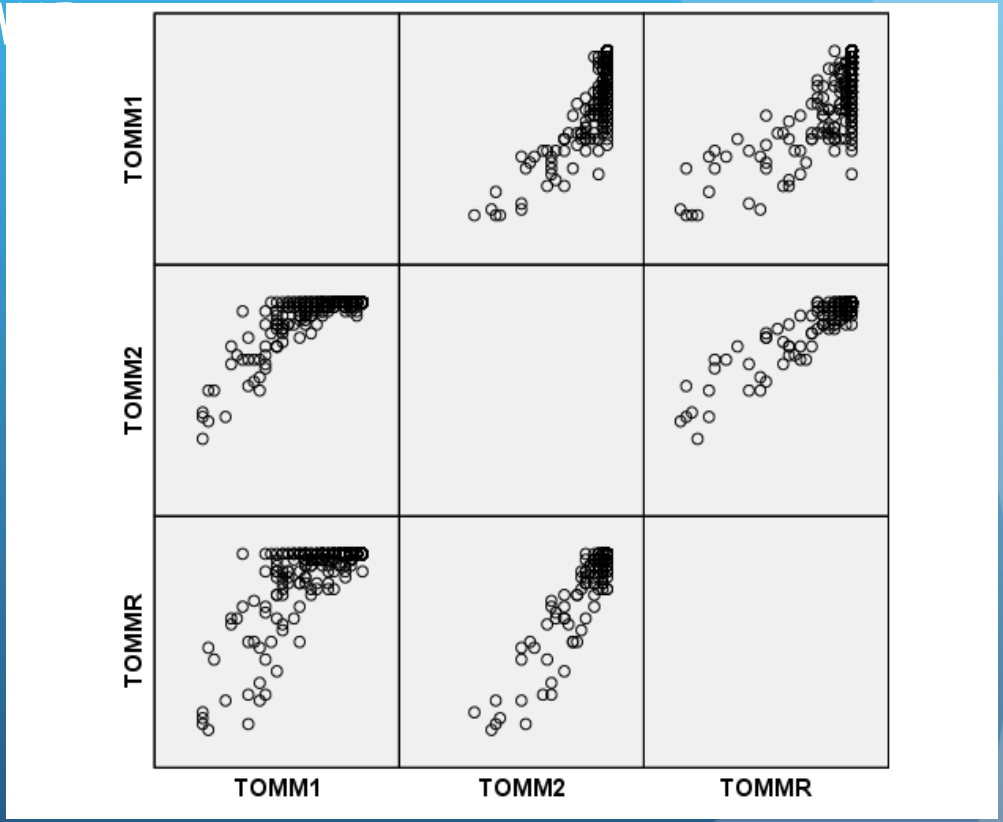


Primary Question

Do different tests of effort measure the same construct?

Results

- A correlation analysis between the TOMM1, TOMM2, and TOM revealed the following significant relationships:
  - TOMM1 & TOMM2: r=.795, n=408, p<.001
  - TOMM1 & TOMMR: r=.754, n=408, p<.001
  - TOMM2 & TOMMR: r=.935, n=408, p<.001

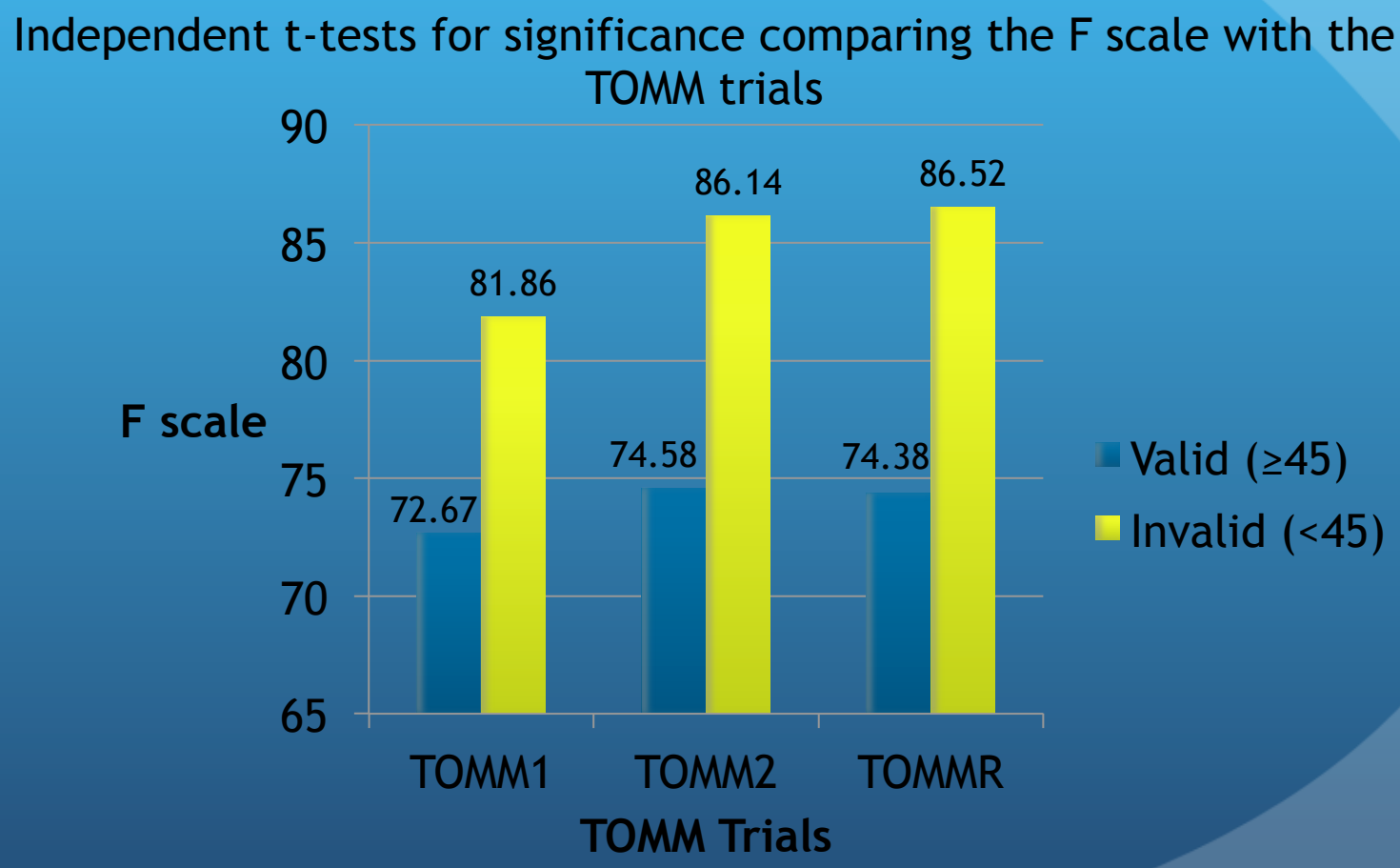


Results

- A correlation analysis between all five variables revealed the following results:

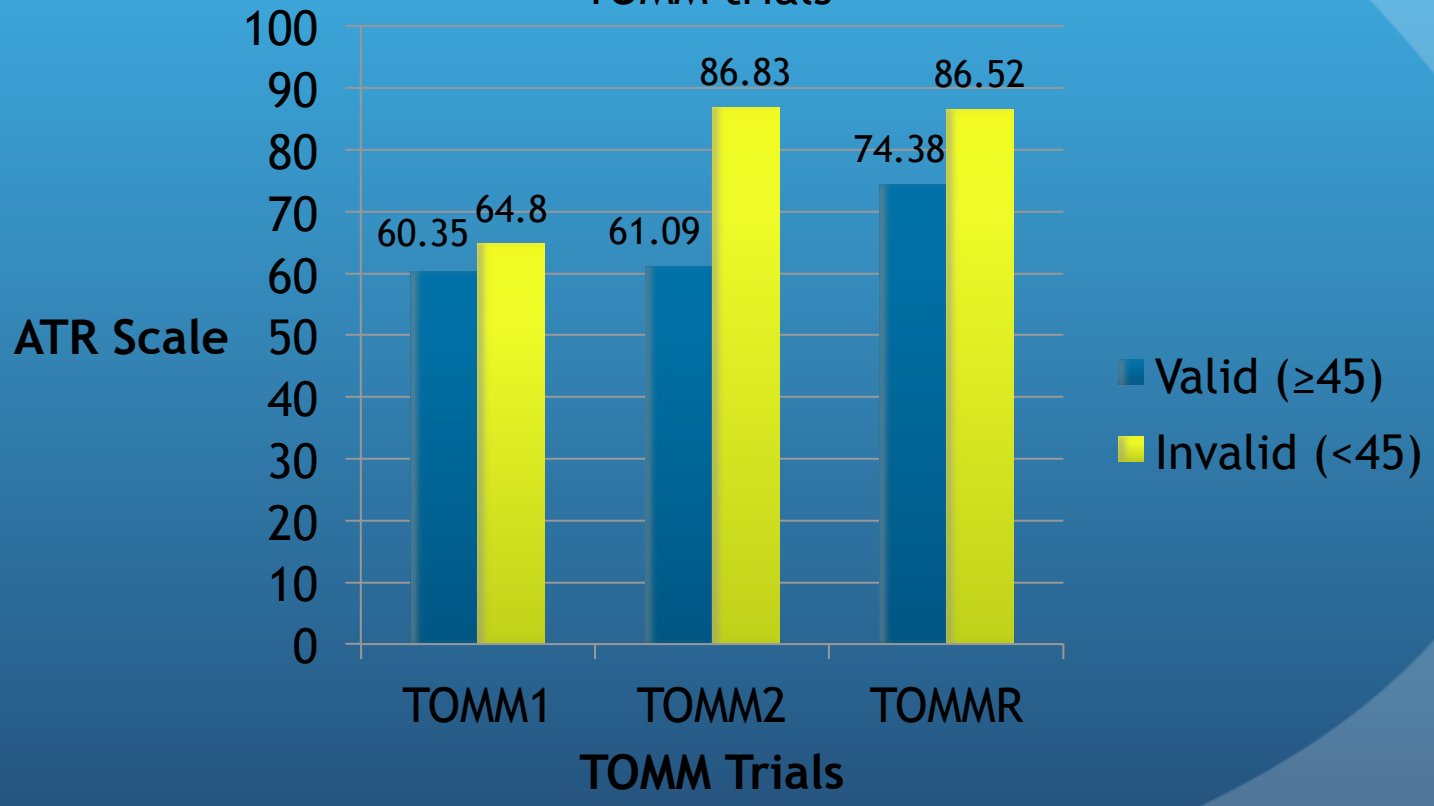
ATR and F scores	r=.660	p<.001
ATR and TOMM1 scores	r=-.188	p<.001
ATR and TOMM2 scores	r=-.183	p<.001
ATR and TOMMR scores	r=-.163	p<.001
F and TOMM1 scores	r=.247	p<.001
F and TOMM2 scores	r=-.199	p<.001
F and TOMMR scores	r=-.188	p<.001

Results


Independent t-tests for significance comparing the F scale with the TOMM trials
90
85
80
75
70
65
F scale
72.67
81.86
74.58
86.14
74.38
86.52
TOMM1
TOMM2
TOMMR
TOMM Trials
Valid (≥45)
Invalid (<45)

Results

Independent t-tests for significance comparing the ATR scale with the TOMM trials



Discussion

- The TOMM displayed a weak, negative correlation with both the ATR scale and the F scale at a significant level
  - Findings are statistically significance, but may not be practically (clinically) significance
    - Statistical significance determines whether or not there was a difference between groups
    - Practical significance asks whether the differences between groups are large enough to have meaning
- Using the TOMM1, TOMM2, TOMMR and F scale as predictors accounted for 44.0% of the variance in the ATR scale
- Using the data based on these three tests, and based on this sample, it appears that effort is a unilateral dimension

Discussion

- The most prominent finding in this study was the relationship between the F scale and the ATR scale
  - r=.660, p<.05
  - Using the F scale alone as a predictor accounted for 43.6% of the variance of the ATR scale
- It can be argued that the ATR scale is a narrow portion of the F scale
- This could possibly aid in the streamlining process of these lengthy neuropsychological evaluations

EXPLORATORY AND CONFIRMATORY FACTOR ANALYSIS

Cuixian Chen, Ph.D., Yishi Wang, Ph.D.

Correlation matrix for TSI1

Correlation matrix for TSI 13 scales

- Intercorrelation between TSI's 13 validity and clinical scales from our preliminary studies:

	ATR	RL	INC	AA	D	AI	IE	DA	DIS	SC	DSB	ISR	TRB
ATR	1.00	-0.30	0.02	0.53	0.56	0.43	0.50	0.48	0.65	0.40	0.40	0.65	0.55
RL	-0.30	1.00	-0.06	-0.56	-0.45	-0.49	-0.42	-0.42	-0.46	-0.28	-0.24	-0.46	-0.37
INC	0.02	-0.06	1.00	0.03	0.03	-0.01	0.05	0.06	0.04	0.10	0.06	0.05	0.01
AA	0.53	-0.56	0.03	1.00	0.67	0.69	0.72	0.66	0.71	0.42	0.29	0.70	0.56
D	0.56	-0.45	0.03	0.67	1.00	0.55	0.61	0.58	0.69	0.49	0.33	0.75	0.57
AI	0.43	-0.49	-0.01	0.69	0.55	1.00	0.63	0.57	0.64	0.40	0.32	0.60	0.68
IE	0.50	-0.42	0.05	0.72	0.61	0.63	1.00	0.85	0.65	0.38	0.30	0.61	0.55
DA	0.48	-0.42	0.06	0.66	0.58	0.57	0.85	1.00	0.64	0.40	0.35	0.64	0.53
DIS	0.65	-0.46	0.04	0.71	0.69	0.64	0.65	0.64	1.00	0.48	0.32	0.79	0.56
SC	0.40	-0.28	0.10	0.42	0.49	0.40	0.38	0.40	0.48	1.00	0.54	0.56	0.55
DSB	0.40	-0.24	0.06	0.29	0.33	0.32	0.30	0.35	0.32	0.54	1.00	0.44	0.77
ISR	0.65	-0.46	0.05	0.70	0.75	0.60	0.61	0.64	0.79	0.56	0.44	1.00	0.65
TRB	0.55	-0.37	0.01	0.56	0.57	0.68	0.55	0.53	0.56	0.55	0.77	0.65	1.00

Correlation from Briere's manual (1995)

Table 7
Correlations Between TSI Scales ($N = 836$)

	ATR	RL	INC	AA	D	AI	IE	DA	DIS	SC	DSB	ISR	TRB
ATR		–.41	.31	.45	.52	.42	.56	.50	.57	.40	.44	.55	.53
RL			–.37	–.58	–.49	–.56	–.43	–.43	–.48	–.35	–.27	–.47	–.39
INC				.46	.44	.36	.46	.49	.40	.31	.28	.40	.31
AA					.74	.71	.69	.68	.72	.49	.43	.74	.62
D						.65	.66	.68	.70	.53	.45	.79	.65
AI							.60	.59	.63	.53	.45	.67	.72
IE								.83	.69	.52	.48	.67	.60
DA									.66	.51	.48	.70	.59
DIS										.58	.51	.76	.66
SC											.66	.63	.58
DSB												.58	.71
ISR													.70

Note. ATR = Atypical Response; RL = Response Level; INC = Inconsistent Response; AA = Anxious Arousal; D = Depression; AI = Anger/Irritability; IE = Intrusive Experiences; DA = Defensive Avoidance; DIS = Dissociation; SC = Sexual Concerns; DSB = Dysfunctional Sexual Behavior; ISR = Impaired Self-Reference; TRB = Tension Reduction Behavior. All *r*s significant at $p < .001$.

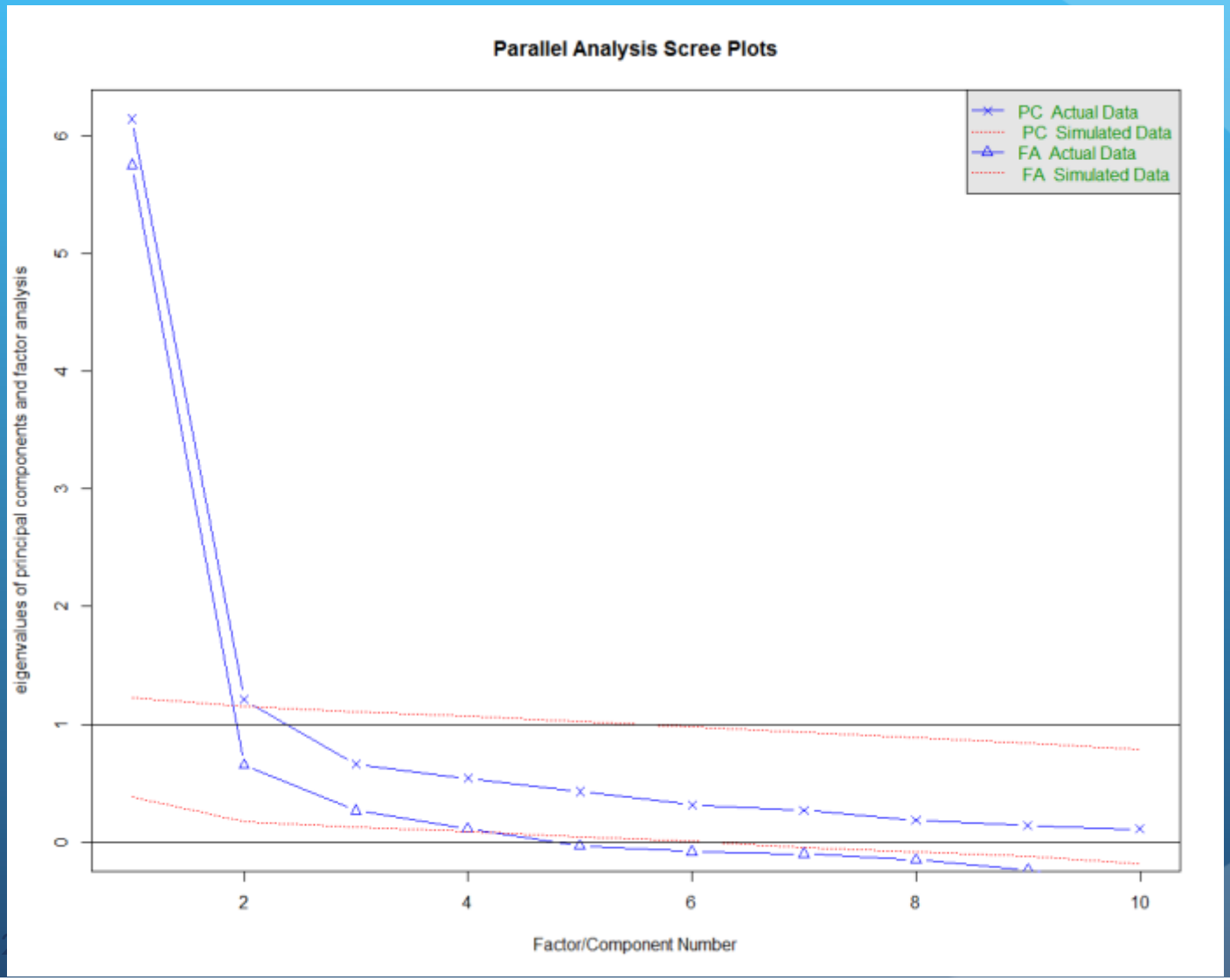
	ATR	RL	INC	AA	D	AI	IE	DA	DIS	SC	DSB	ISR	TRB
ATR	NA	-0.3	0.02	0.53	0.56	0.43	0.50	0.48	0.65	0.40	0.40	0.65	0.55
RL	NA	NA	-0.06	-0.56	-0.45	-0.49	-0.42	-0.42	-0.46	-0.28	-0.24	-0.46	-0.37
INC	NA	NA	NA	0.03	0.03	-0.01	0.05	0.06	0.04	0.10	0.06	0.05	0.01
AA	NA	NA	NA	NA	0.67	0.69	0.72	0.66	0.71	0.42	0.29	0.70	0.56
D	NA	NA	NA	NA	NA	0.55	0.61	0.58	0.69	0.49	0.33	0.75	0.57
AI	NA	NA	NA	NA	NA	NA	0.63	0.57	0.64	0.40	0.32	0.60	0.68
IE	NA	NA	NA	NA	NA	NA	NA	0.85	0.65	0.38	0.30	0.61	0.55
DA	NA	NA	NA	NA	NA	NA	NA	NA	0.64	0.40	0.35	0.64	0.53
DIS	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.48	0.32	0.79	0.56
SC	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.54	0.56	0.55
DSB	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.44	0.77
ISR	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.65
TRB	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Table 7
Correlations Between TSI Scales ($N = 836$)

	ATR	RL	INC	AA	D	AI	IE	DA	DIS	SC	DSB	ISR	TRB
ATR		–.41	.31	.45	.52	.42	.56	.50	.57	.40	.44	.55	.53
RL			–.37	–.58	–.49	–.56	–.43	–.43	–.48	–.35	–.27	–.47	–.39
INC				.46	.44	.36	.46	.49	.40	.31	.28	.40	.31
AA					.74	.71	.69	.68	.72	.49	.43	.74	.62
D						.65	.66	.68	.70	.53	.45	.79	.65
AI							.60	.59	.63	.53	.45	.67	.72
IE								.83	.69	.52	.48	.67	.60
DA									.66	.51	.48	.70	.59
DIS										.58	.51	.76	.66
SC											.66	.63	.58
DSB												.58	.71
ISR													.70

Explorative Factor Analysis (EFA) on TSI dataset

Determine number of factors for TSI



EFA on TSI Clinical scales – 2 factors

```
> fa(Clinical,nfactors=2,n.obs=443, fm="pa", rotate="varimax")
Factor Analysis using method =  pa
Call: fa(r = Clinical, nfactors = 2, n.obs = 443, rotate = "varimax",
    fm = "pa")
Standardized loadings (pattern matrix) based upon correlation matrix
     PA1  PA2   h2   u2 com
AA  0.83 0.22 0.73 0.27 1.1
D   0.72 0.30 0.62 0.38 1.3
AI  0.68 0.32 0.57 0.43 1.4
IE  0.81 0.20 0.70 0.30 1.1
DA  0.77 0.24 0.65 0.35 1.2
DIS 0.80 0.27 0.71 0.29 1.2
SC  0.38 0.53 0.43 0.57 1.8
DSB 0.11 0.91 0.84 0.16 1.0
ISR 0.75 0.41 0.73 0.27 1.6
TRB 0.47 0.77 0.82 0.18 1.7

                       PA1  PA2
SS loadings           4.51 2.29
Proportion Var        0.45 0.23
Cumulative Var        0.45 0.68
Proportion Explained  0.66 0.34
Cumulative Proportion 0.66 1.00
```

EFA from Briere's manual – 2 factors

Table 8
Rotated Factor Loadings for Two TSI Factors (Exploratory Factor Analyses)

	Standardization sample		Clinical sample	
TSI scale	**Factor 1**	**Factor 2**	**Factor 1**	**Factor 2**
Anxious Arousal	**.86**	.24	**.82**	.32
Depression	**.82**	.31	**.86**	.20
Anger/Irritability	**.71**	.39	**.53**	**.49**
Intrusive Experiences	**.81**	.28	**.80**	.21
Defensive Avoidance	**.82**	.27	**.81**	.24
Dissociation	**.76**	**.40**	**.81**	.30
Sexual Concerns	.35	**.78**	.35	**.71**
Dysfunctional Sexual Behavior	.21	**.91**	.11	**.94**
Impaired Self-Reference	**.75**	**.48**	**.75**	**.43**
Tension Reduction Behavior	**.54**	**.69**	**.40**	**.83**
Percent of variance	66.9	9.1	61.7	12.0

Note. Coefficients considered meaningful at $|c| \geq .40$ are bolded.

Comparison EFA from Briere's manual

Table 8
Rotated Factor Loadings for Two TSI Factors (Exploratory Factor Analyses)

TSI scale	Standardization sample		Clinical sample	
	Factor 1	Factor 2	Factor 1	Factor 2
Anxious Arousal	**.86**	.24	**.82**	.32
Depression	**.82**	.31	**.86**	.20
Anger/Irritability	**.71**	.39	**.53**	**.49**
Intrusive Experiences	**.81**	.28	**.80**	.21
Defensive Avoidance	**.82**	.27	**.81**	.24
Dissociation	**.76**	**.40**	**.81**	.30
Sexual Concerns	.35	**.78**	.35	**.71**
Dysfunctional Sexual Behavior	.21	**.91**	.11	**.94**
Impaired Self-Reference	**.75**	**.48**	**.75**	**.43**
Tension Reduction Behavior	**.54**	**.69**	**.40**	**.83**
Percent of variance	66.9	9.1	61.7	12.0

Note. Coefficients considered meaningful at $|c| \geq .40$ are bolded.

	PA1	PA2
AA	0.83	0.22
D	0.72	0.30
AI	0.68	0.32
IE	0.81	0.20
DA	0.77	0.24
DIS	0.80	0.27
SC	0.38	0.53
DSB	0.11	0.91
ISR	0.75	0.41
TRB	0.47	0.77

Summary to EFA on TSI clinical scales

- Exploratory Factor Analysis (EFA) on the military veterans' dataset gives **consistent results** with [Briere TSI manual], except the loading of SC on Factor 2: our result gives 0.53, while [Briere TSI manual] gives 0.78.
- Our EFA results indicated Factor 1 with clinical scales of AA, D, AI, IE, DA, DIS, and TSR, while Factor 2 with clinical scales of SC, DSB and TRB.
- It comes to same conclusion that there are two independent factors, called "**Generalized Trauma and Distress**" and "**Self-Dysfunction**".

Confirmative Factor Analysis (CFA)

Confirmative Factor Analysis

- In [Briere TSI 1995 manual], he considered three models:
- (1) a four-factor model with Trauma, Self, Dysphoria, and Sexuality.
- (2) a three-factor model with Trauma, Self, and Dysphoria.
- (3) a two-factor model with Generalized Trauma & Distress, and Self-Dysfunction.

CFA 2-/3- factor model from Briere (1995)

- We have conducted both two- and three-factor models from Briere (1995).
- However, the two-factor model yielded the following results: RMSEA=0.19, NFI=0.83, NNFI=0.80, CFI=0.84.
- The three-factor model yielded: RMSEA=0.19, NFI=0.86, NNFI=0.80, CFI=0.87. NFI and CFI results are lower than the 0.91 presented in Briere (1995).
- Thumb of rules: NFI and CFI larger than 0.9.

CFA 2-/3- factor model from Briere (1995)

- We further investigated two-factor model by merging trauma and dysphoria factors in Snyder et al (2009), which yielded RMSEA=0.18, NFI=0.86, NNFI=0.81, CFI=0.87.
- All these preliminary results suggested that our acquired dataset may contain different latent structure, which required further investigation.
- This could be due to the clinical sample used here versus the sample from largely normal populations.

Summary

- Overall neuropsychological profile
- Detection of suboptimal effort
- Application of sophisticated analyses to data set

- Multidisciplinary
- Multilevel
- Interface the bench to the clinic

Next Steps:

Data Mining
Data Cleaning

Grant NIH R-15

Prospective Research