Interventions for Postconcussion Symptoms (PCS)

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This IRB approved work is in compliance with APA ethical standards in the treatment of research participants

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Objectives

- Briefly define and review mild traumatic brain injury (mild TBI) and recovery
- Review non-medication treatment approaches for Postconcussion Symptoms (PCS)
- Preliminary Results of Web-Based Tx Study
- Conclusion and future directions

Poll Question #1

- My interest in mild TBI is as a:
  - Clinician
  - Researcher
  - Clinician-researcher
  - Manager or policy-maker
  - Other

What is a TBI?

Traumatic Brain Injury Definition

- TBI – any traumatically induced structural injury and/or physiological disruption of brain function as a result of an external force

- Concussion or mild TBI is one of the most common forms of combat-related injury

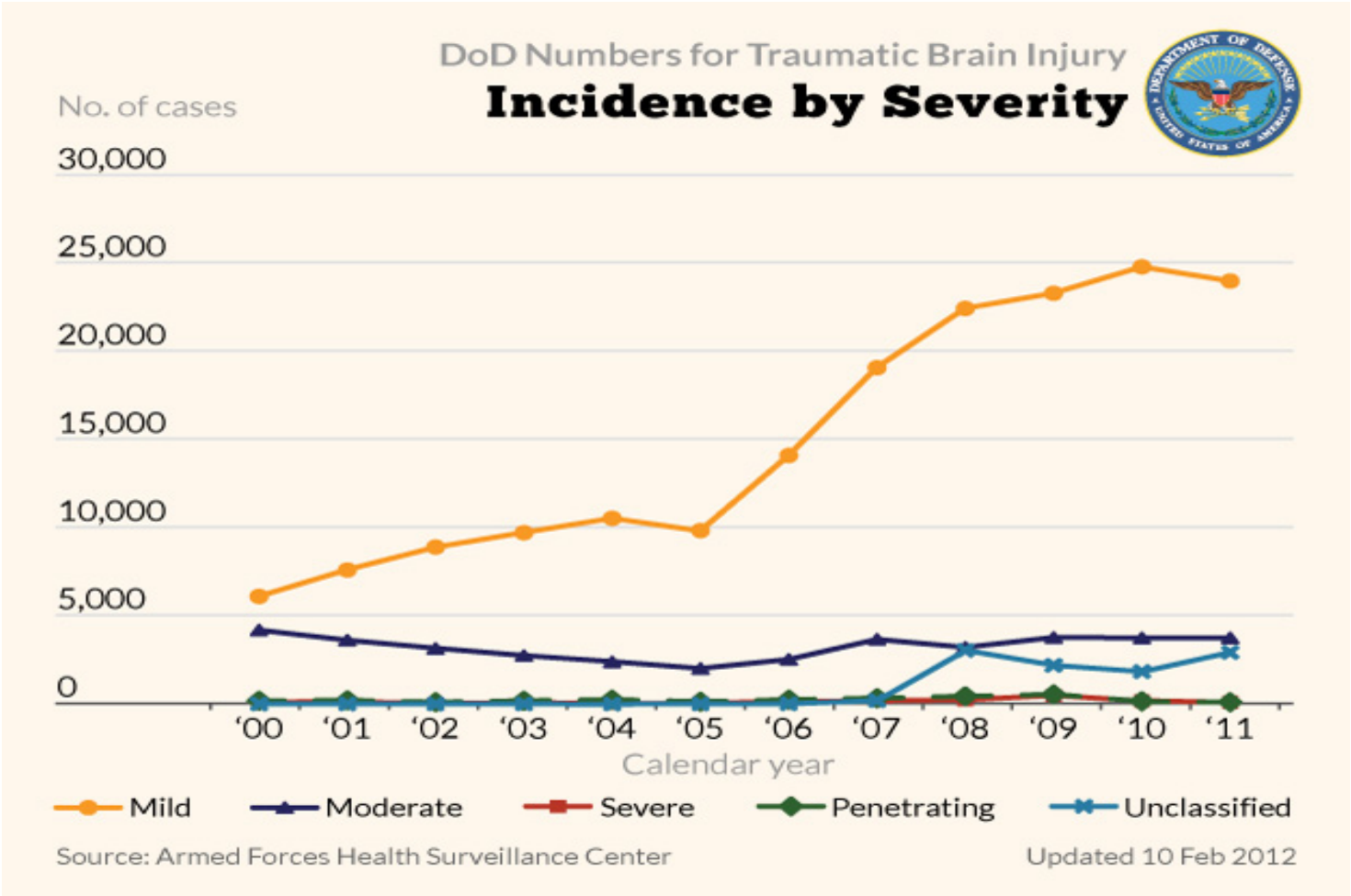
DoD/DVA Consensus Criteria for TBI Severity

Mild	Moderate	Severe
LOC ≤ 30 min with normal CT &/or MRI	LOC >30 min and < 24 hours with normal or abnormal CT &/or MRI	LOC > 24 hours with normal or abnormal CT &/or MRI
GCS 13-15	GCS 9-12	GCS < 9
PTA ≤ 24hr	PTA >1 day and ≤ 7days	PTA > 7days

http://www.publichealth.va.gov/docs/vhi/traumatic-brain-injury-vhi.pdf

Mild TBI Sequelae

- Most individuals recover completely within days or weeks after a mild TBI (concussion)
- Yet, a subgroup experience postconcussive symptoms (PCS sxs) in chronic stages
  - Nonspecific symptoms
- Postconcussion Symptoms
  - Physical
    - Headache, dizziness, fatigue, noise/light intolerance, insomnia
  - Cognitive
    - Memory complaints, poor concentration
  - Emotional
    - Depression, anxiety, irritability, mood lability



http://www.defense.gov/home/features/2012/0312_tbi/

Types of Mild TBI Interventions

- Symptom-based (e.g., headaches)
- Behavioral health
  - sleep hygiene, diet, exercise, etc
  - Cognitive-behavioral psychotherapy
- **Education**

Mild TBI Psychoeducation

- Brief Psychoeducational Interventions may include:
  - Defining the injury and what is expected
  - Normalization of symptoms
  - Reassurance of positive expectation of recovery
  - Providing specific coping strategies
- "Recovering from Head Injury: A Guide for Patients" (Mittenberg et al., 1993)

PCS Intervention Review

Positive Tx Effect – Educational Approaches

First Author	Year Published	Design	Intervention(s) Tested	Study Sample	Tx and Control Groups	Follow-Up	Tx Effect?
Alves	1993	RCT	1. Information + reassurance of recovery 2. Information only 3. Control	Hospitalized after mild TBI	N=201 N=176 N=210	3, 6, 12 months	Yes*
Bell	2008	RCT	1. Handout + telephone counsel (4-5 calls over 12 weeks) providing education and reassurance and individualized plans for symptom management 2. Handout in ED	Within 48 hours of injury	N=146 N=166	6 months	Yes
Minderhoud	1980	Retrospective comparison	Printed + verbal education + activity encouraged after week of bed rest.	Hospitalized after mild TBI	N=180 N=352	6 months	Yes
Mittenberg	1996	RCT	Printed manual + one-hour session	Hospitalized after mild TBI	N = 29 N = 29	6 months	Yes
Ponsford	2002	Alternate assignment to group	Information booklet	Hospital emergency room (within a week)	N=79 N=123	3 months	Yes
Wade	1998	RCT	Printed and verbal education + continued support as needed	7 to 10 days post-injury	N=132 N=86	6 months	Yes

*For reassurance treatment group only, assuming that patients not seen at follow-up are asymptomatic

No Tx Effect – Educational Approaches

First Author	Year Published	Design	Intervention(s) Tested	Study Sample	Tx and Control Groups	Follow-Up	Tx Effect?
Gronwall	1986	Not randomized	Information booklet	Within 2 weeks of injury	N=34 N=54	3 months	No
Hinkle	**1986**	**RCT**	**1. Information** **2. Information + reassurance** **3.Control (return to normal activity)**	**Hospitalized after mild TBI (10% had positive imaging)**	**N=166** **N=75**	**3 months**	**No*** **
Matuseviciene	2013	RCT	1. Assessment + verbal education + printed education + gradual return to activity 2. Printed information	Recruited in ED and symptomatic at 10 days; intervention at 14-21 days post-injury	N=39 N=41	3 months	No

***Tx groups returned to daily/social fx sooner

Positive Tx Effect – Other Approaches

First Author	Year Published	Design	Intervention(s) Tested	Study Sample	Tx and Control Groups	Follow-Up	Tx Effect?
Bryant	2003	RCT	1.CBT 2.Supportive Counseling	Within 2 weeks of injury	N=12 N=12	6 months	Yes**
Cicerone	2002	Prospective case comparison	Attention strategy training hourly for 11 to 27 weeks	Average of 7.6 months post-injury with cognitive impairment	N=4 N=4	Post-treatment (roughly 16 weeks)	Yes
Ferguson as reported in Miller	1995	Pre-Post	12-session manualized cognitive-behavioral treatment	Referrals to outpatient clinic	N=4	12 weeks	Yes
Hanna-Pladdy	2001	RCT	Relaxation	Less than 1 to multiple years post-injury	N=44 N=44	Post-stress induction or none	Yes
Leddy	2013	Quasi-random assignment with matched control	1. Exercise 2. Stretching 3. Healthy Control	Average of 117 days post-injury with PCS	N=4 N=4 N=4	Post-treatment (roughly 17 weeks)	Yes
Leonard	2004	RCT	1. Group CBT 2. Group Education/Support 3. Control	?	N=15 N=16 N=9	?	Yes
Silverberg	2013	RCT	1.CBT 2.Printed education + 3 hour educational session	Less than 6 weeks post-injury (average of 24 days); symptomatic	N=13 N=11	3 months post-injury	Yes
Tiersky	2005	RCT with multiple baselines	CBT+cognitive treatment for 11 weeks	Average of 5 years post-injury	N=7 (milds) N=9	1 and 3 months	Yes

No Tx Effect – Other Approaches

First Author	Year Published	Design	Intervention(s) Tested	Study Sample	Tx and Control Groups	Follow-Up	Tx Effect?
Azulay	2013	Pre-Post	Mindfulness training	7 to 36 months post-injury	N=22	Post-treatment	No
Elgmark	2007	RCT	Information, support by multiple disciplines (mostly OT)	Median of 3 weeks post-injury	N=264 N=131	12 months	No
Ghaffar	**2006**	**RCT**	**Multidisciplinary treatment**	**Within 1 week of injury**	**N=97** **N=94**	**6 months**	**No**
Paniak	1998, 2000	RCT	1. Assessment and feedback+treatment as needed for symptoms 2. Single session education + brochure	Hospital emergency room (12 days post-injury)	N=53 N=58	3 to 4 months, 12 months	No
Relander	**1972**	**RCT**	**Seen daily at hospital + encouragement to get out of bed + Physical Therapy**	**Within 36 hours of hospital admission (not all milds)**	**N=82** **N=96**	**12 months post-injury**	**No*** **

***Tx group returned to work sooner

Intervention Review Conclusions

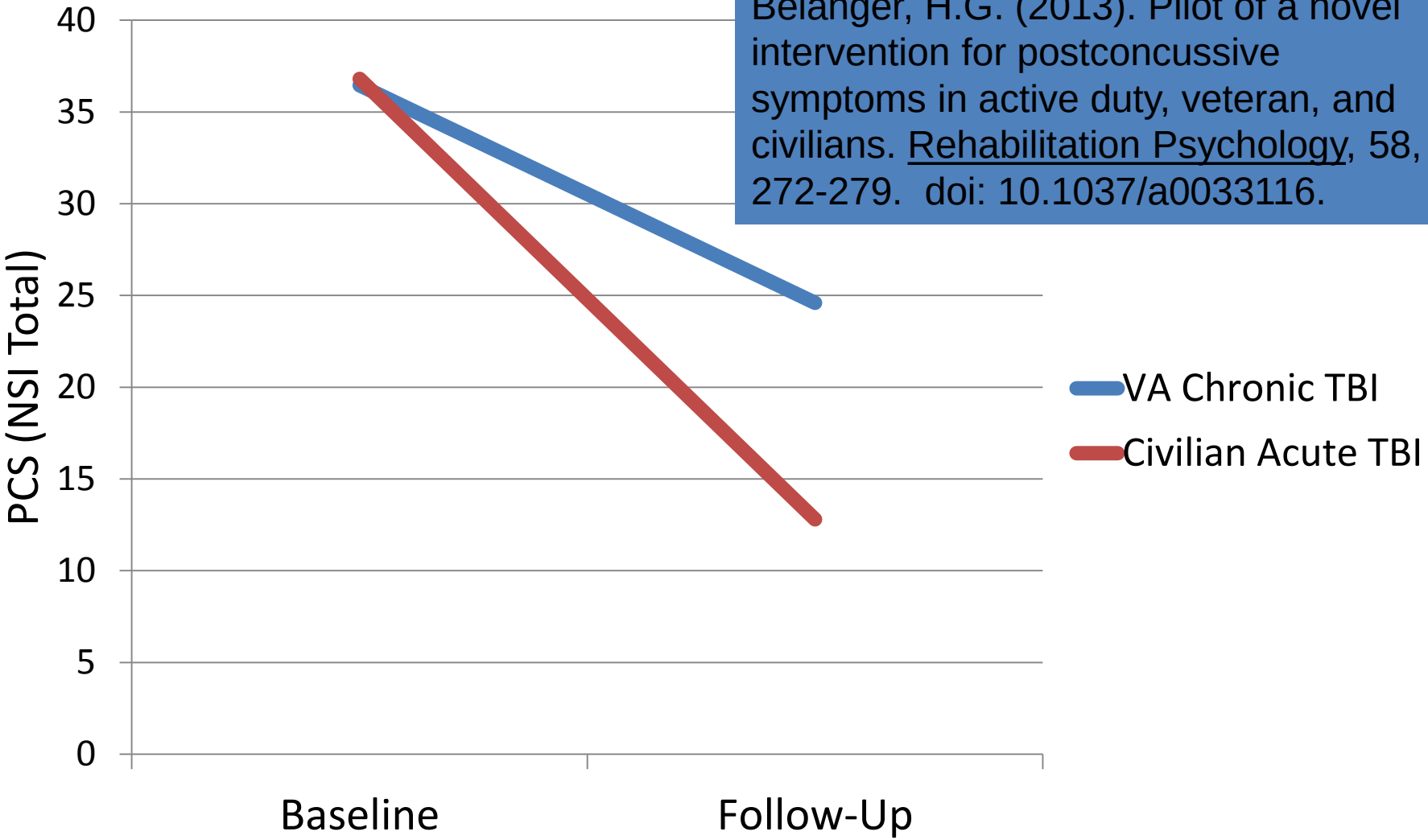
- The 4 psychoeducational studies with prospective RCT's conducted within one week of injury all demonstrated significantly reduced PCS at follow-up following psychoeducational interventions administered in acute phase
- Hard to draw many other conclusions due to different treatment approaches, participants (e.g., time since injury).
- Other approaches (in particular CBT in post-acute and chronic phases) have demonstrated efficacy

Gaps in the Treatment Literature

- Additional information is needed about potential impact of education in more chronic populations
- May be reluctant to seek out traditional care or not have access
  - Need for alternative delivery system

Pilot Study Results – Desktop Protot

King, E.G, Kretzmer, T., Vanderploeg, R.D., Asmussen, S., Clement, V.L., & Belanger, H.G. (2013). Pilot of a novel intervention for postconcussive symptoms in active duty, veteran, and civilians. Rehabilitation Psychology, 58, 272-279. doi: 10.1037/a0033116.



Current Study

- Randomized Control Trial
  - Examine changes in PCS from baseline (Pre-Tx) to 7 Days and 6 Months Post-Tx
  - Self-administered, interactive web-based intervention
    - Adapted from Mittenberg et al. (1993) material
    - Relevant post-combat material added

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Setting and Participants

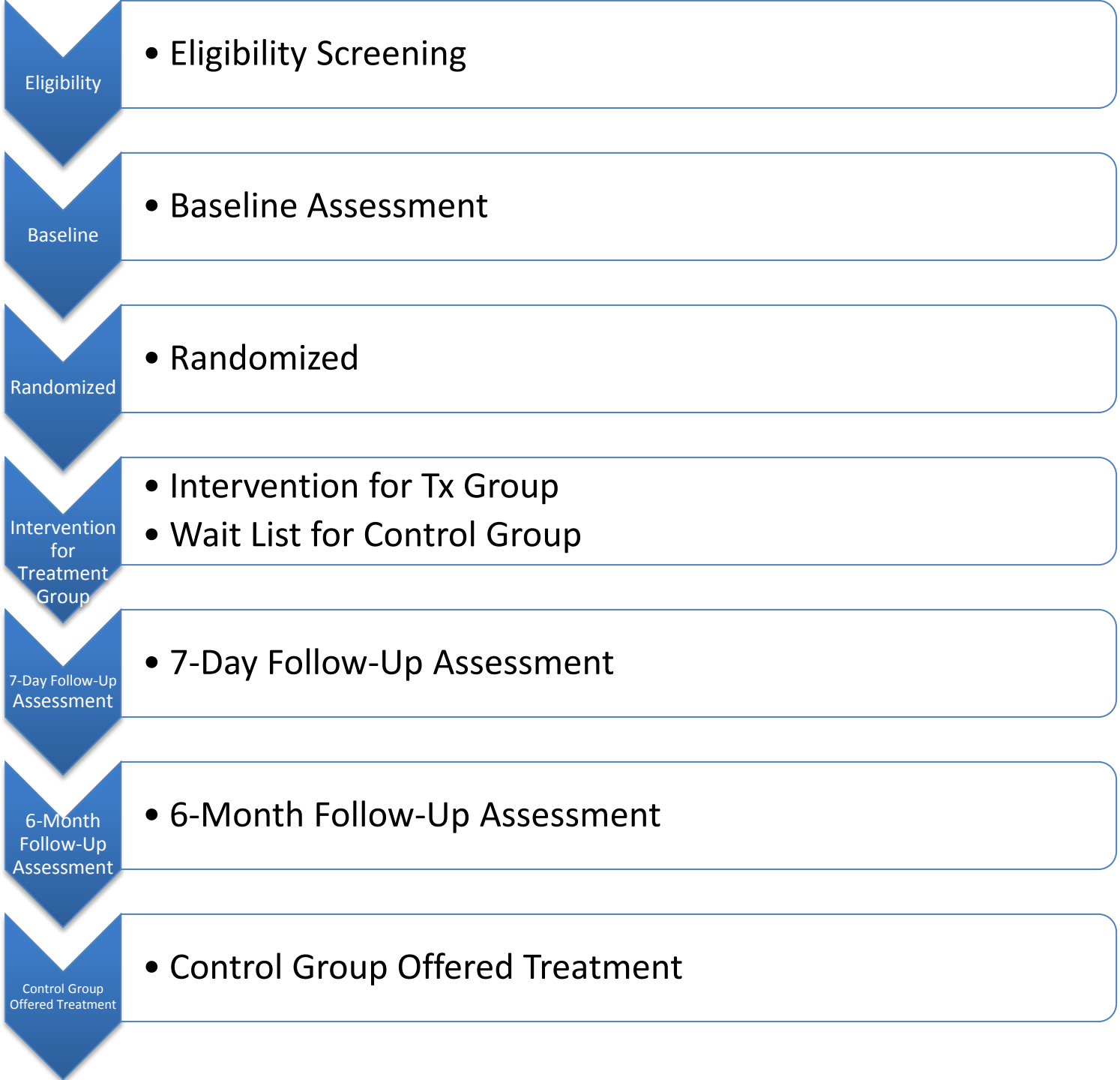
- Inclusion Criteria:
  - History of Mild TBI
  - Aged 18-55
  - Access to internet
  - English-speaking
  - Willing to be randomized

Setting and Participants

- Exclusion Criteria:
  - History of Moderate-Severe TBI
  - Comorbid CNS disease (MS, seizures, encephalitis)
  - Major Psychiatric Disorder (other than PTSD or Depression)
  - Did not experience any sxs at injury and/or are not currently reporting any sxs
  - Suicidal/homicidal

Recruitment

- Subset (~30%) recruited in person to verify diagnosis through medical record review and structured interview
- All others recruited on-line through various means
  - TBI, Deployment, and other list serves
  - Flyers
  - Outreach


Eligibility
• Eligibility Screening
Baseline
• Baseline Assessment
Randomized
• Randomized
Intervention for Treatment Group
• Intervention for Tx Group
• Wait List for Control Group
7-Day Follow-Up Assessment
• 7-Day Follow-Up Assessment
6-Month Follow-Up Assessment
• 6-Month Follow-Up Assessment
Control Group Offered Treatment
• Control Group Offered Treatment

Outcome Measure

- A Priori Primary Outcome Measure = Neurobehavioral Symptom Inventory (NSI)
  - 22 symptoms, each rated on 5 point severity scale
  - cognitive, somatic, psychological symptoms

- Also created an “Attribution Scale” by asking whether they believed each symptom was due to concussion (0-22)

Other Measures

- Self-Efficacy
  - Self Efficacy for Symptom Management Scale (SEsx)
- Quiz
  - 19 questions about typical recovery, injury severity indices, and symptoms based on educational content provided in Mittenberg et al. 1993
- Brief Symptom Inventory (BSI)
  - 18-item shortened version of the Symptom Checklist 90-Revised
- Depression
  - CESD
- Posttraumatic Stress Disorder
  - PCL

Intervention

mTBI - Module 2 - Windows Internet Explorer provided by James A. Haley Veterans Hospital

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mTBI - Module 2

Mild Traumatic Brain Injury - Survey

Page 2 of 8

What is a Concussion?

There has been a lot of news media about the number of concussions resulting from the Iraq and Afghanistan wars, as well as the number occurring in various professional sports arenas. Fortunately, doctors know a lot about concussions.

What is a concussion? It is the same thing as a mild TBI. Specifically, it's a blow to the head that results in less than 30 minutes of lost consciousness or change in consciousness. **In other words, you had a concussion if you were "knocked out" for less than 30 minutes or not knocked out at all but were briefly confused**. We will use the term 'concussion' here because most people are more familiar with it.

Being hit in the head might cause memory loss for events surrounding the injury. For example, it is not uncommon for soldiers to report that they remember "waking up" and feeling confused in the aftermath of an explosion without remembering the explosion itself or events immediately before or after. Some people think that in order to recover, they need to remember these events. That may never happen because the brain was not laying down new memories during that period. Think about it – if you are knocked out, how can you remember events during that time period?

<< Back Next >>

Internet 100%

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Mild Traumatic Brain Injury - Survey

Incorrect

Question: What is a concussion?
Answer: blow to the head resulting in <30 minutes of lost consciousness or change in consciousness

Correct

Question: Recovery from concussion can happen more slowly when
Answer: a person is over 40 and/or has had multiple concussions

Incorrect

Question: Symptoms of concussion can look similar to.
Answer: symptoms of stress, including everyday stress and deployment-related stress.

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Mild Traumatic Brain Injury Research Study
Page Tools

Mild Traumatic Brain Injury Research Study

USF Health

- About the Study
- What is a Traumatic Brain Injury (TBI))
- What is a Concussion
- Coping after a Concussion
- Managing Your Symptoms
- Take Home Points
- Resources

You have completed the third section!

Thank you for completing "What is a Concussion." Please move on to "Coping after a Concussion."

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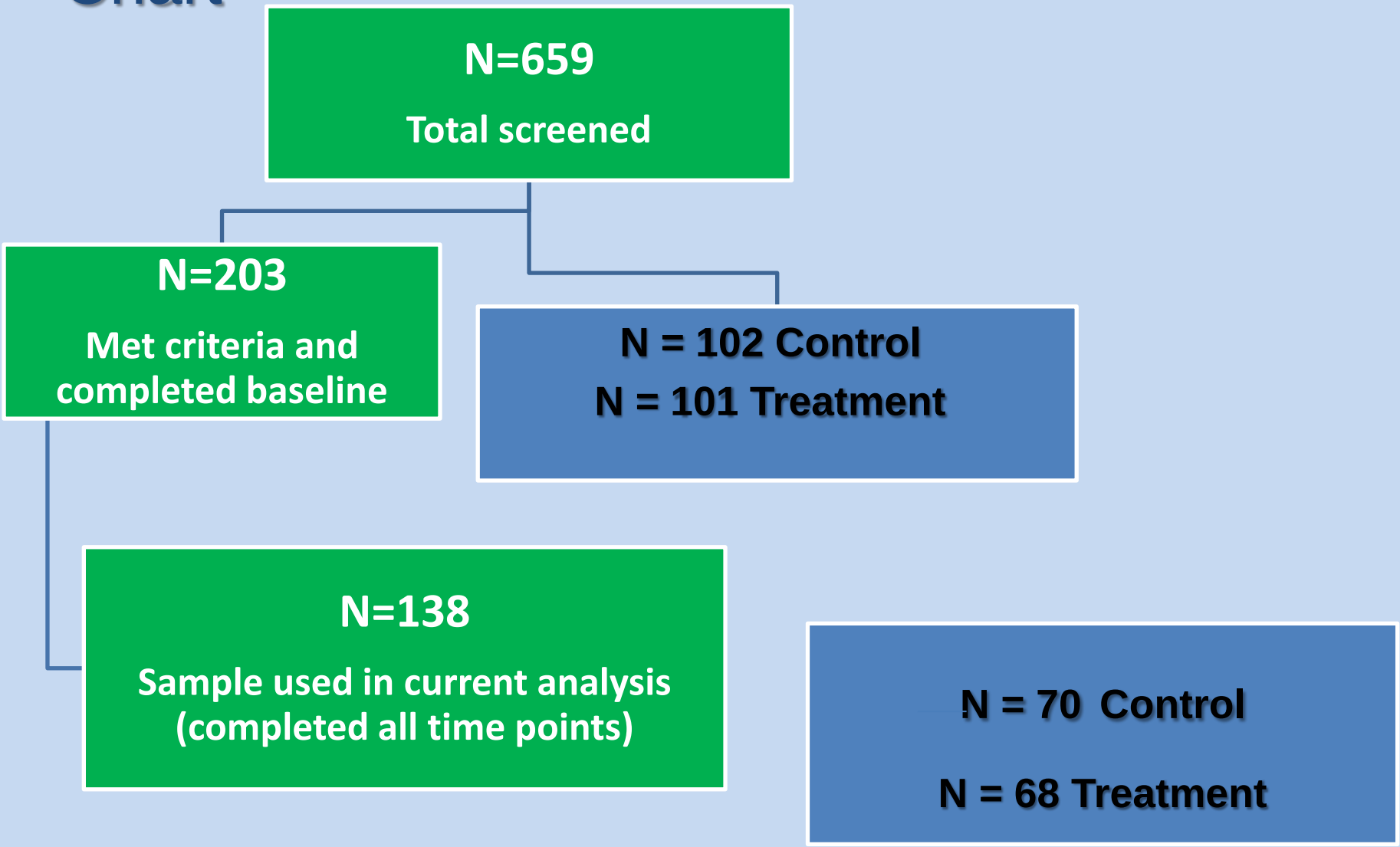
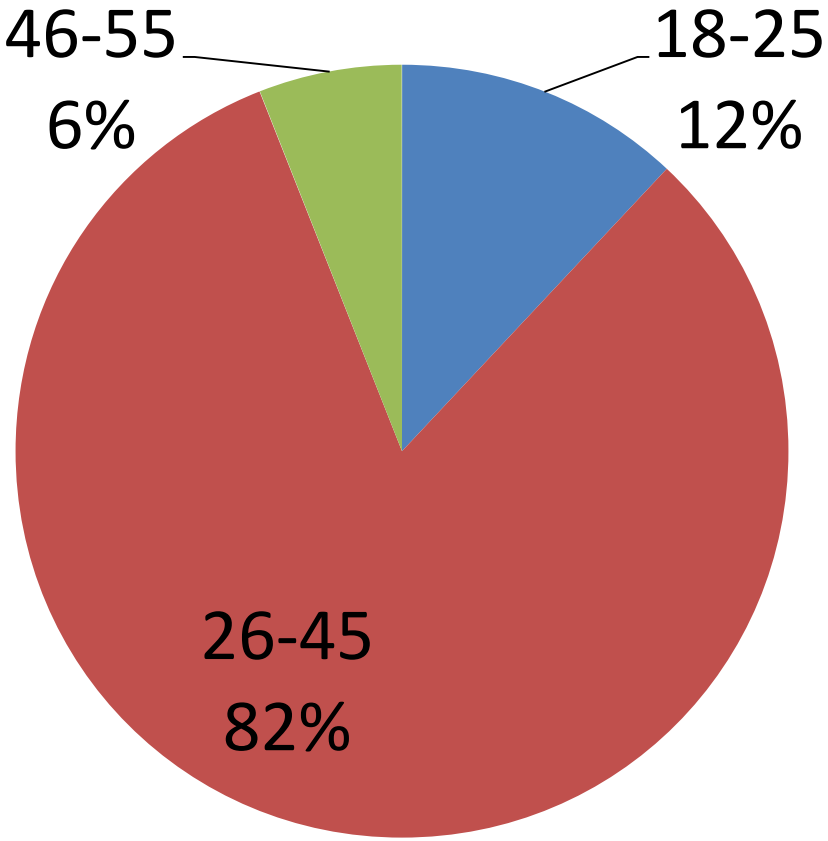
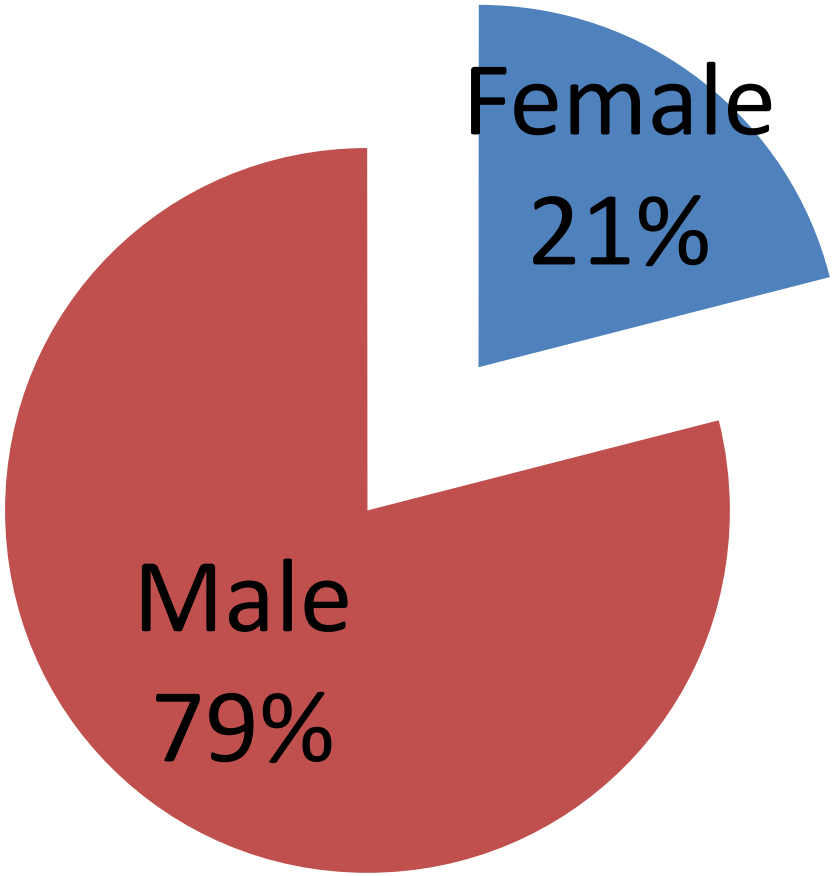
Study Flow Chart



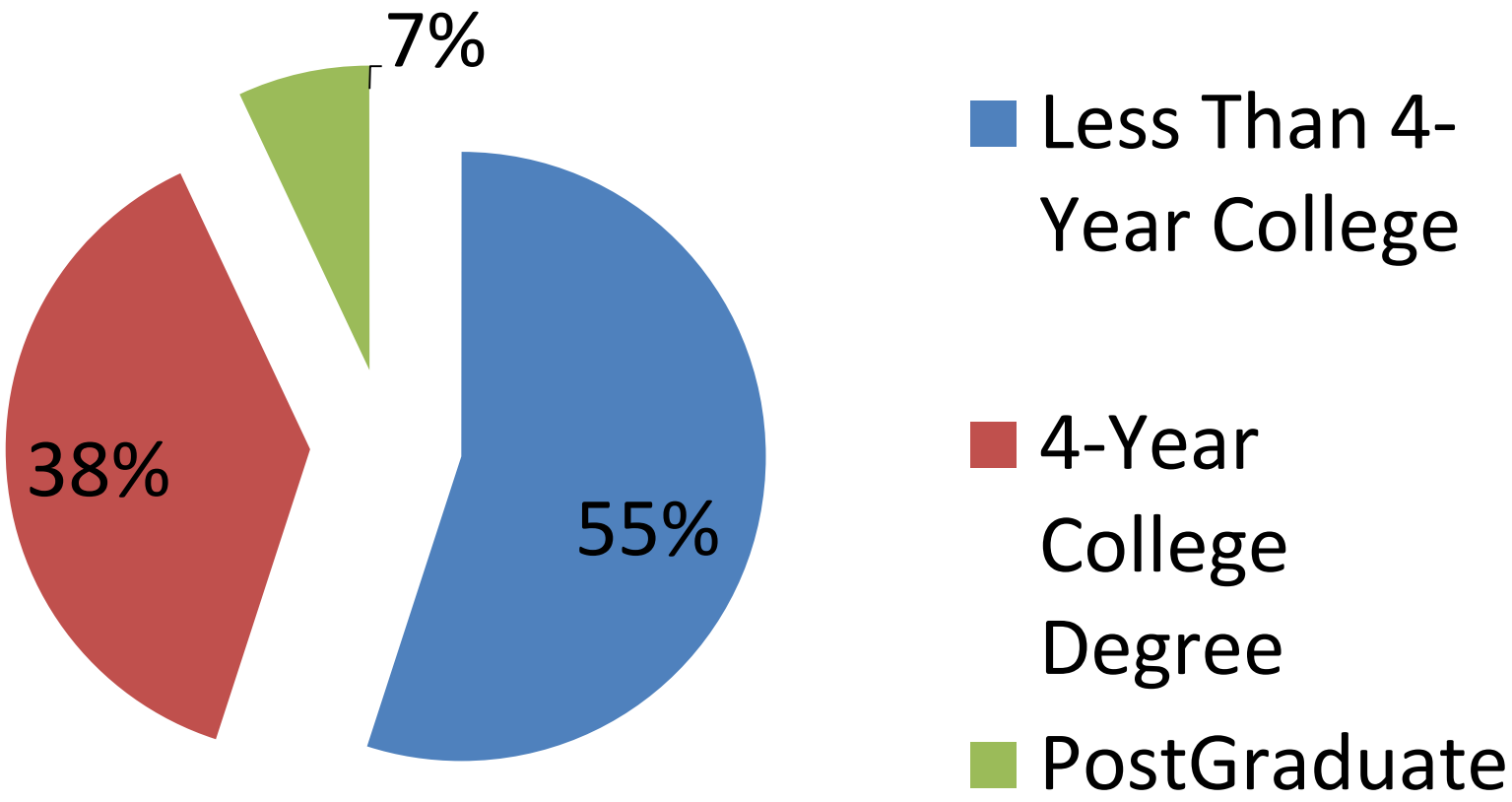
Age (N=138)



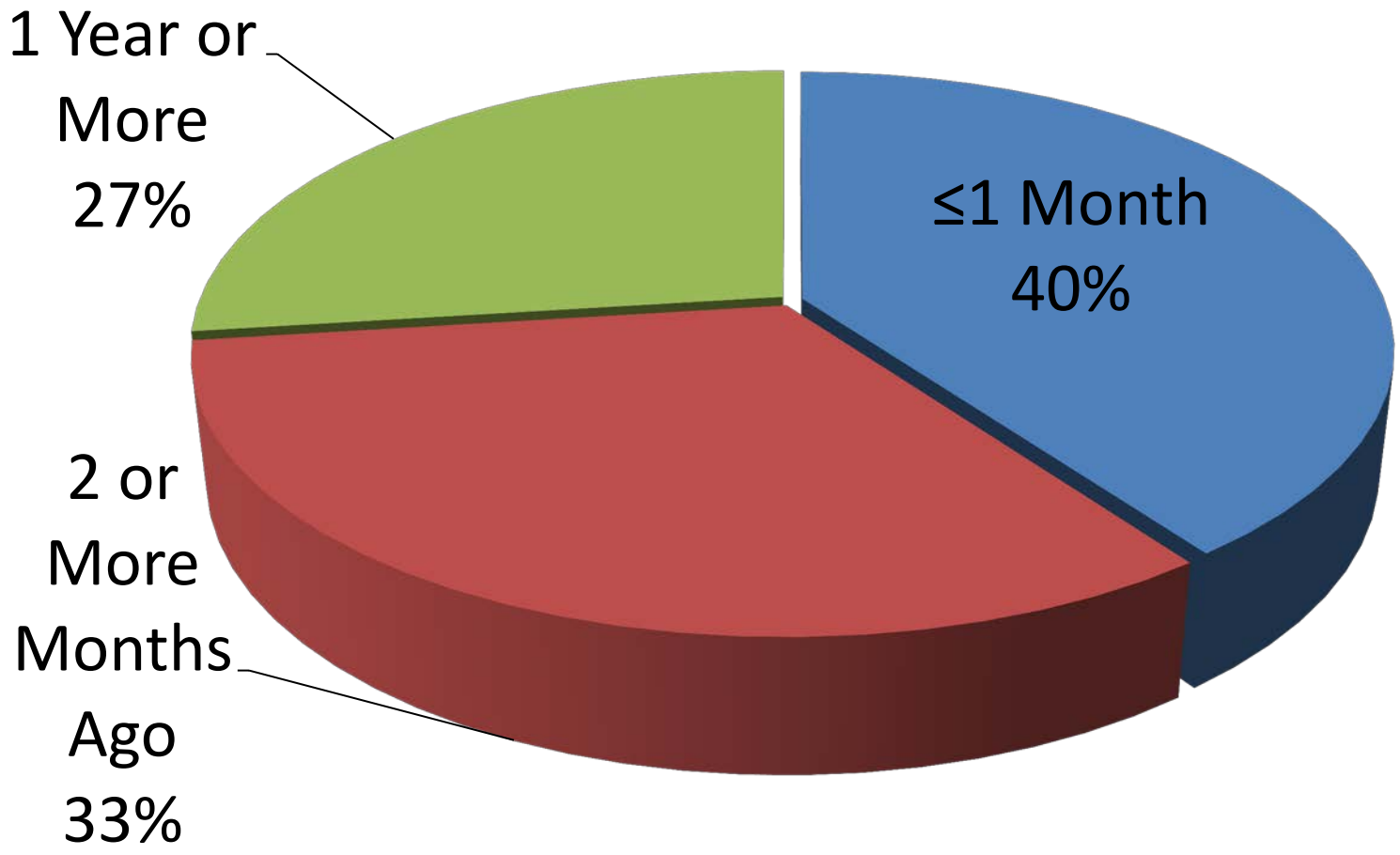
Gender (N=138)



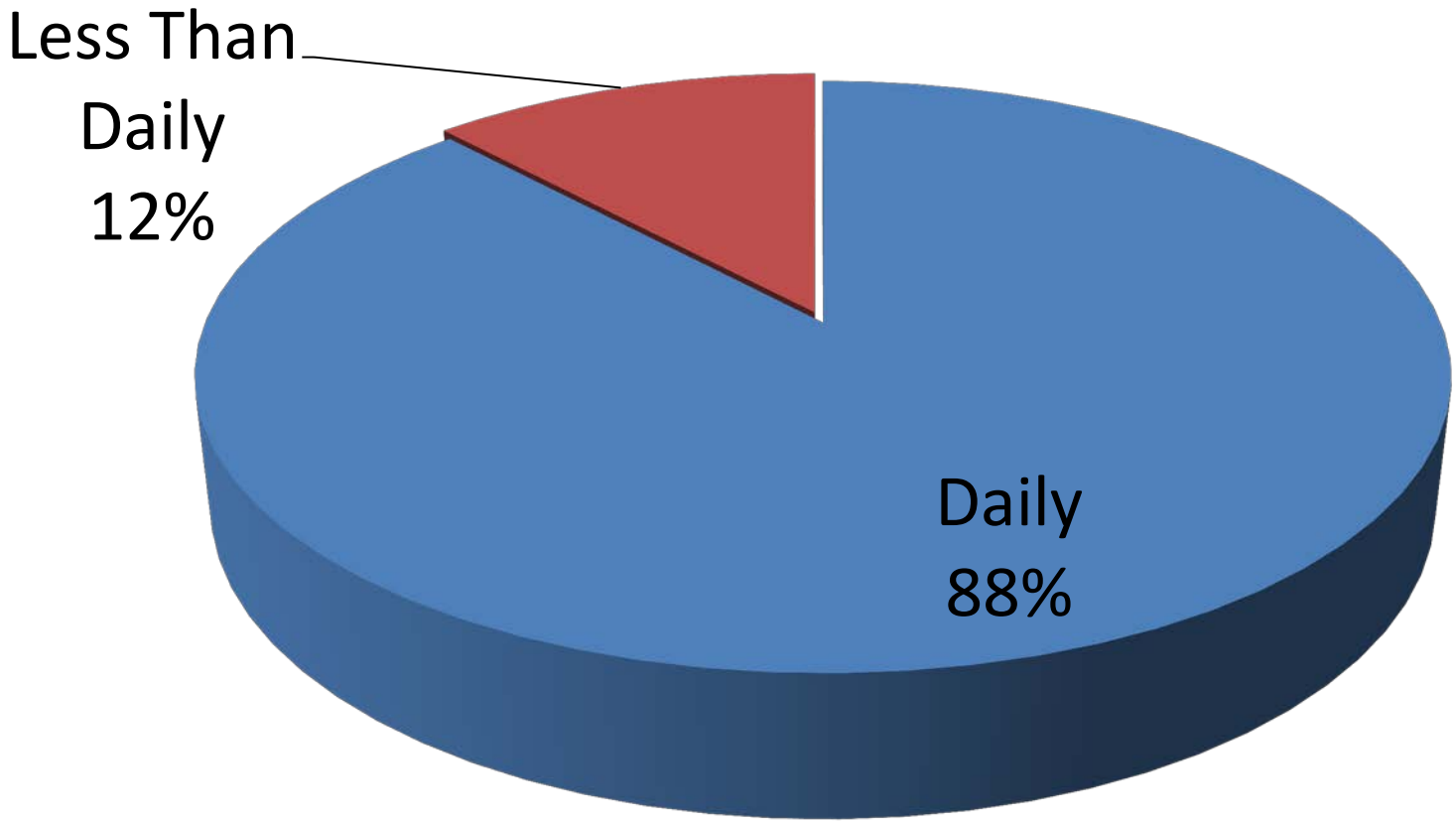
Education Level (N=138)



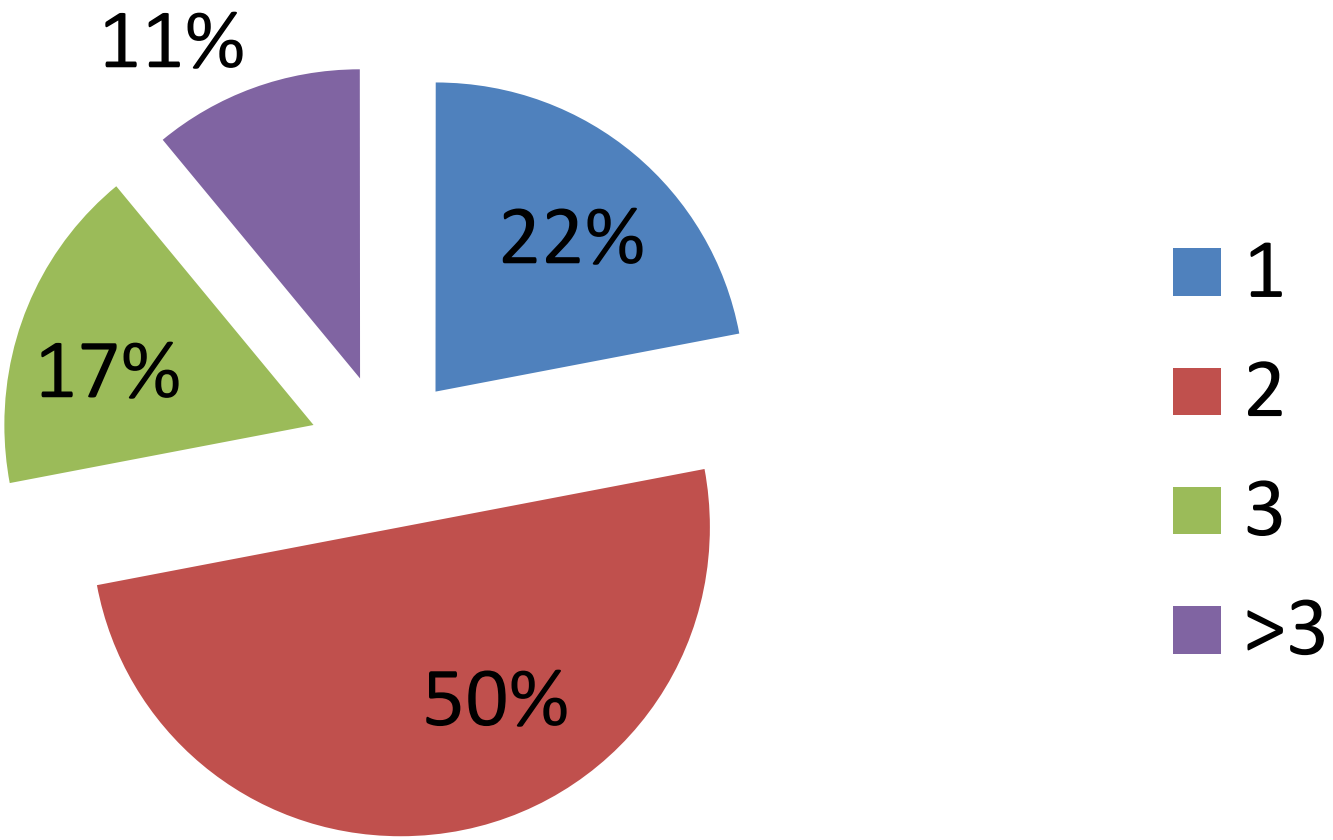
Acuity (Time Since Injury)



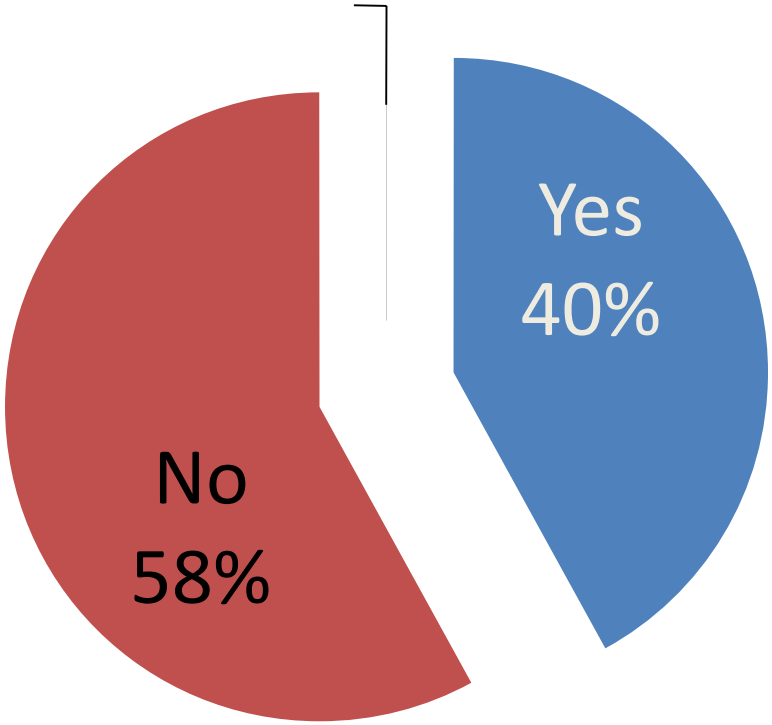
How Often Do You Use Internet?



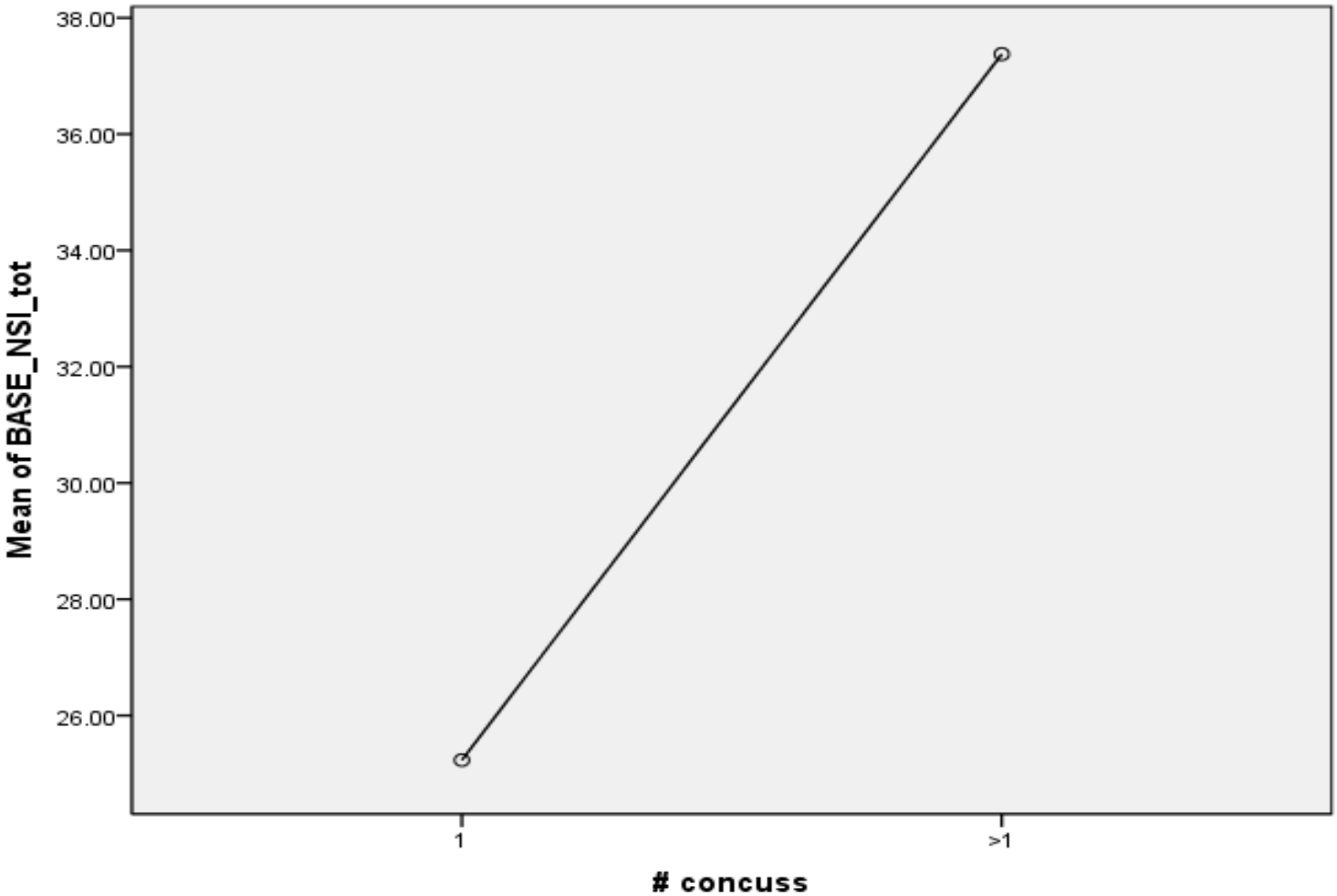
Number of Concussions Reported



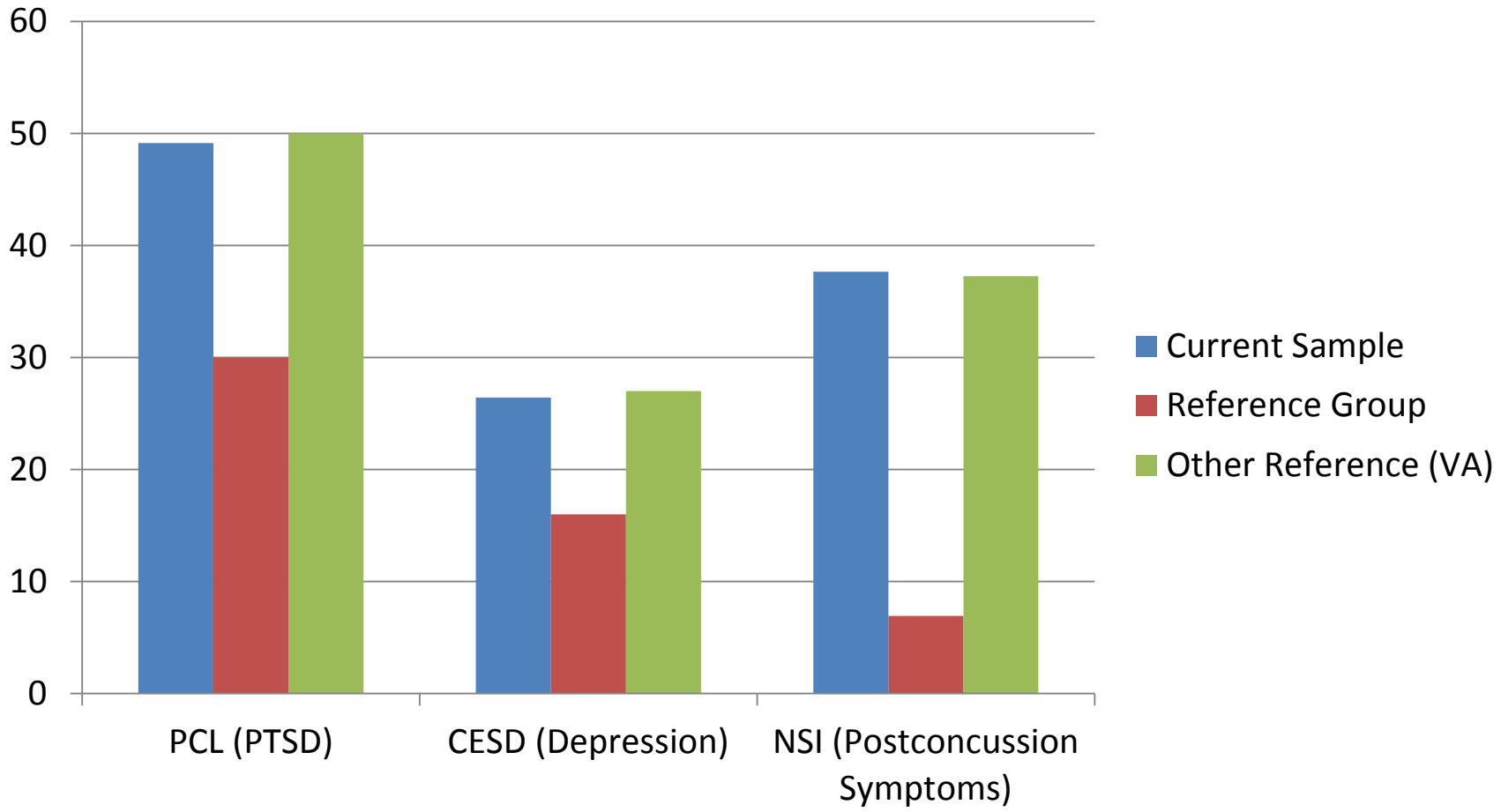
Disability and/or Litigation Hx (N=138)



Those with >1 Concussion Report More PCS at Baseline Than Those with 1 (p < .001)



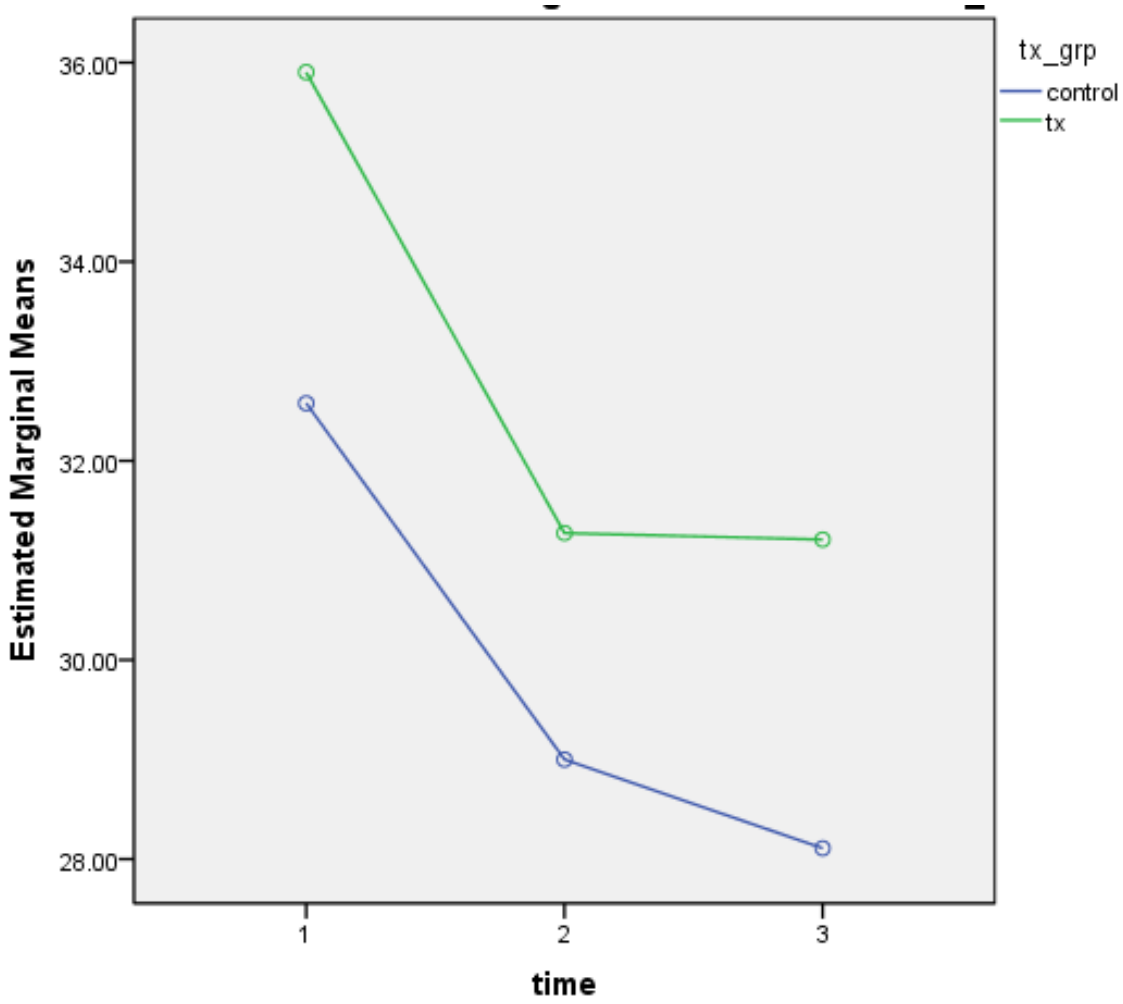
Sample Characteristics



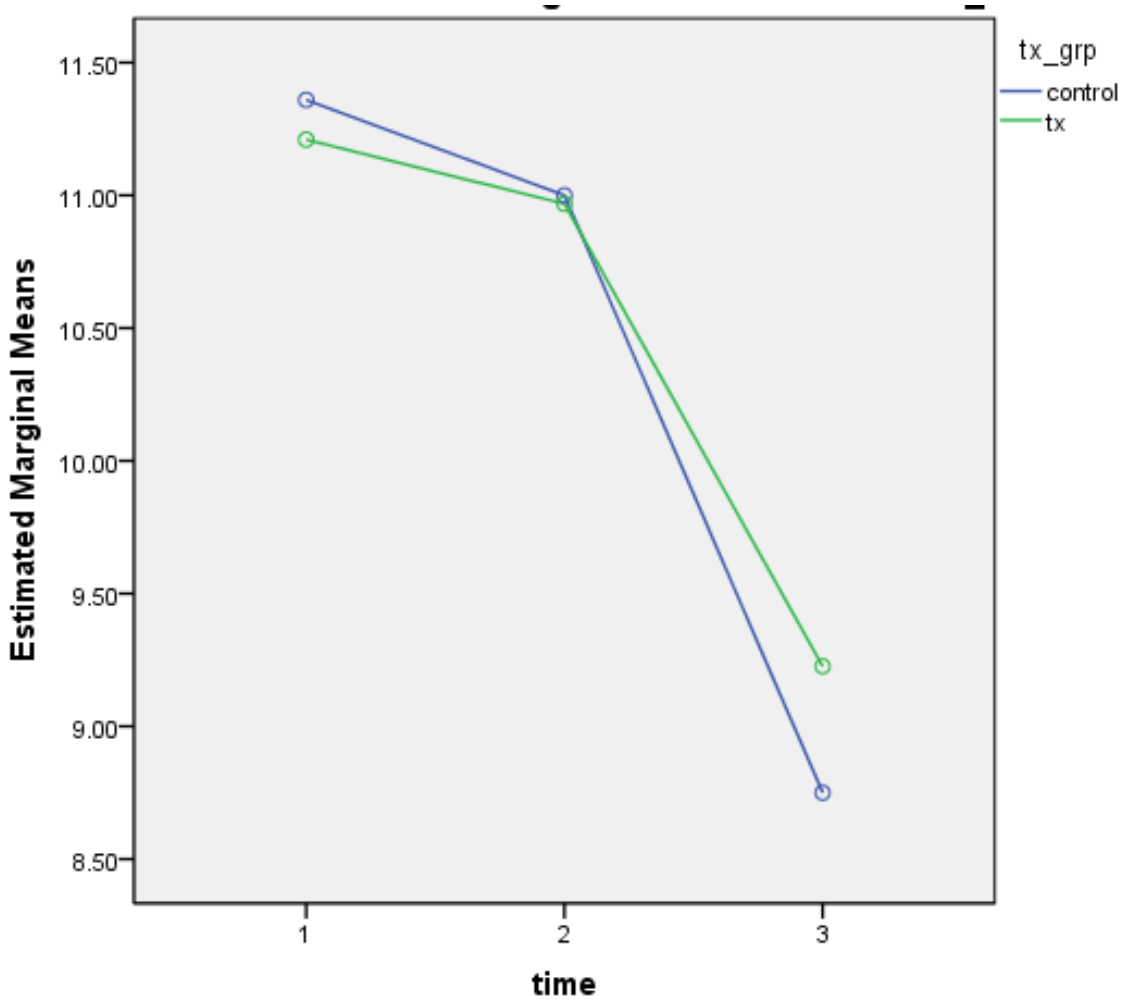
Primary Analyses

- Treatment and Control Group did not differ on any outcome measure or demographic variables at baseline
- Complete case analysis
- Repeated Measures with the following time points:
  - Baseline
  - 7 Days post treatment
  - 6 Months post treatment

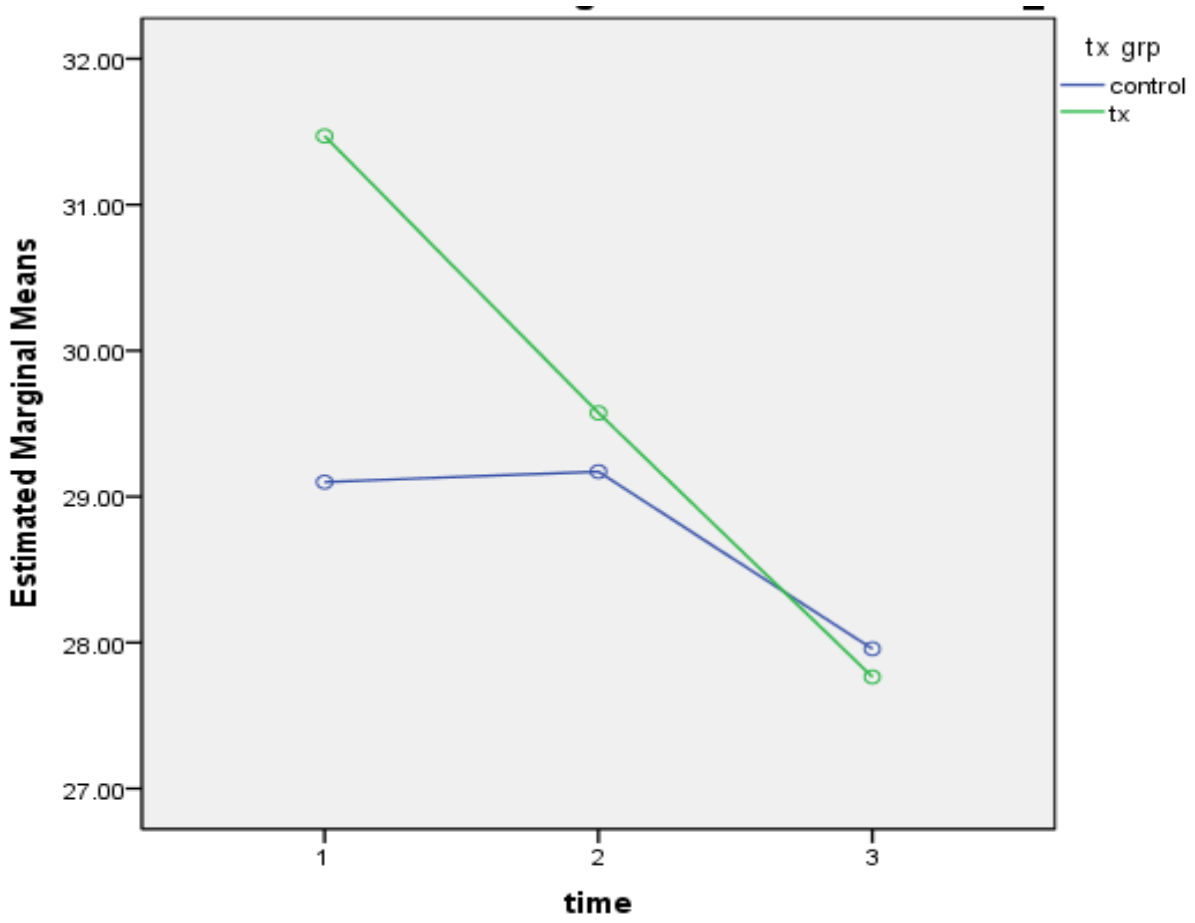
No differential effect on symptom severity across time by group (p > .05)



No differential effect on attributions



No differential effect on Psychological Distress (BSI), p = .12



What is Related to Reduction of PCS from Baseline to 6 Months?

Those who tended to show the most recovery (vis-à-vis symptom severity) had:

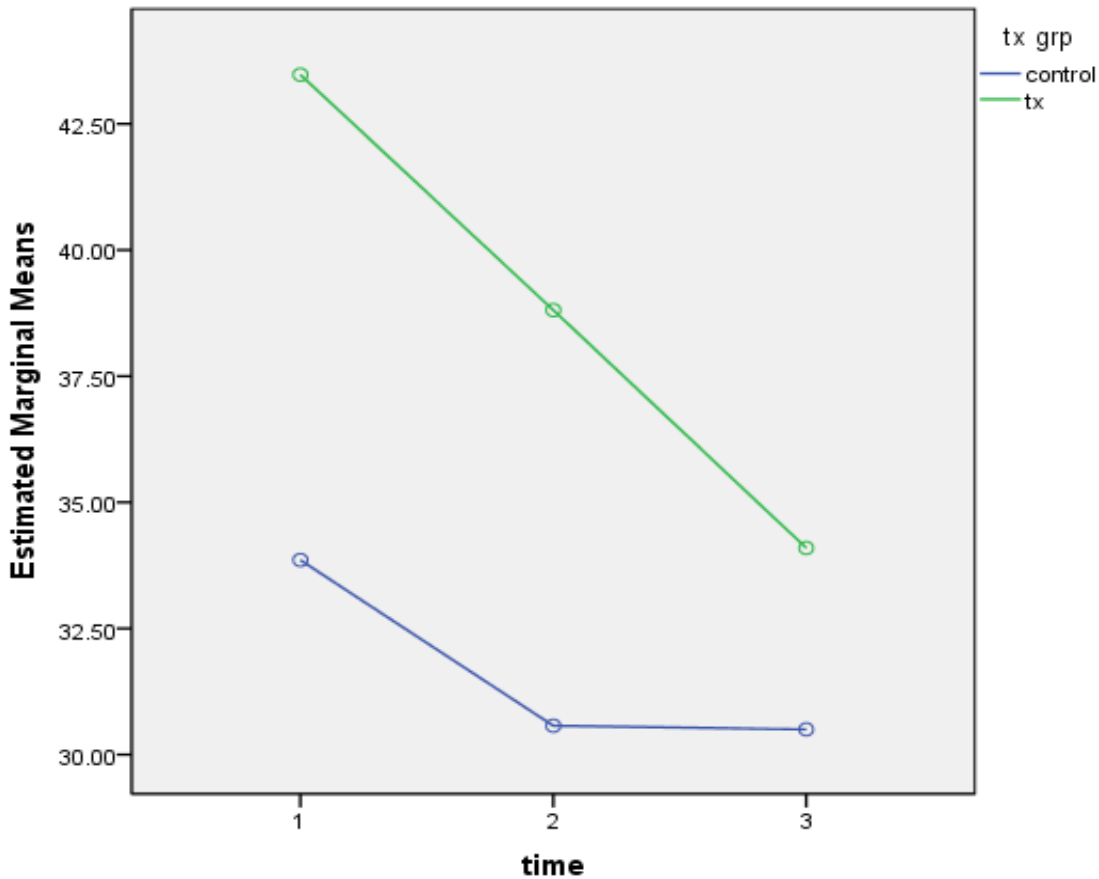
- More symptoms at baseline (r=.52)
- Greater self-efficacy at baseline (r=.34)
- Greater baseline satisfaction with

- Greater perception that concussion adversely impacted life at baseline (r=.24)
- Fewer attributions to concussion over time (r=.35)

Conclusion

- No impact of intervention at follow-up
- Some suggestion that symptom reduction related to things like social support, self-efficacy, changing attributions or expectancies

If we only look at those in the tx group who showed change in expectancies….

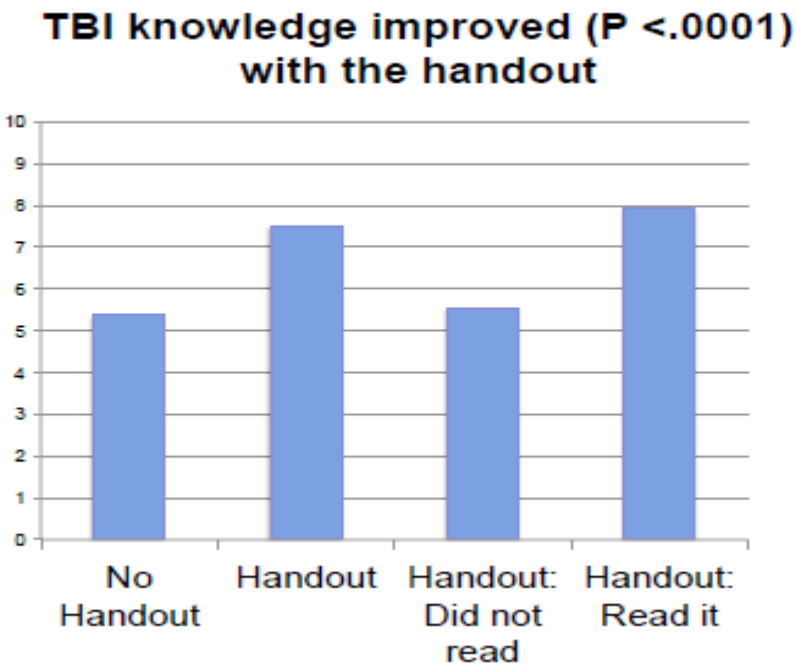


Hamblen, Bernardy, Sayer, Nelson, Schnurr & Forshay (unpublished data)

- 1,236 Veterans screened for TBI:
  - ½ received information handout on mild TBI
  - ½ received no booklet

Hamblen et al.

– Knowledge of mild TBI increased with handout



Hamblen et al.

– Handout had no effect on expectations (but did increase self-rating of understanding symptoms)

Veterans perceive symptoms have a negative impact on their life, regardless of handout

	No Handout Mean (0-10)	Handout Mean (0-10)	Cohen's d
Sx affect Life	6.92	6.79	.06
Sx duration	7.59	7.61	.01
Sx control	4.00	4.16	.06
Perceived tx effect	6.44	6.52	.03
Sx concern	7.65	7.46	.08
Sx understand	5.08	5.92	.30*
Sx affect emotion	7.56	7.32	.09

Final Thoughts

- We can increase knowledge with information administered in more chronic phase post-concussion but effect on attributions/positive expectancies less clear
  - But “in person” administration not tested
- Some evidence for other approaches like CBT but the literature is currently somewhat sparse and heterogeneity across studies makes generalization difficult

Crosswords to Computers:
Review of Computer-based Cognitive Training Programs

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Crosswords to Computers

- Review of the empirical literature on popular and publically available computer-based cognitive training programs
- Discuss applicability of these programs to those with a history of mild traumatic brain injury

Traditional Cognitive Rehabilitation

- Restoration, improvement or strengthening of cognitive skills
- Improvement in functioning
- Defined number of in-person sessions
- Led by a qualified professional
- Empirical support (Cicerone et al., 2011)

‘Analog’ Cognitive Enhancement

- Reading
- Board Games
- Musical Instruments
- Traveling
- Knitting
- Gardening
- Playing Bridge
- Crossword puzzles
- Juggling

Clarkson-Smith and Hartley, 1990, Fabrigoule et al.; 1995; Verghese et al., 2003, Draganski et al., 2004, Pillai et al., 2011, Hambrick et al., 1999

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Computer-Based Training

- Cognitive enhancement strategies have gained recent popularity - $300 million industry predicted to increase to $2-8 billion by 2015.
- Has the potential to benefit clinical and non-clinical populations.
- As computer-based cognitive training becomes more relevant it warrants greater scientific scrutiny.

Computer-based Cognitive Training/Enhancement

- **Game-like tasks**
  - Finding a target in an array of distractors
  - List learning
- **Repeated trials**
- **Speed/complexity of task increases as performance improves**
- **3-5 days per week, 15-100 minutes a day, for 4-12 weeks**

Examples of Popular Programs

- Brain HQ
- Braintrain
- Cogmed
- Cognifit
- Lumosity

This presentation is not intended to endorse any particular entity or product.

Poll Question

- **Do you use any computer cognitive enhancement program with your patients?**
- **Yes**
- **No**

Computer-based Training Outcomes

- **Successful cognitive training programs will elicit effects that generalize to untrained, practical tasks for extended periods of time**
- **Converging evidence of significant improvements in trained cognitive tasks**
- **More limited evidence of improvements in untrained tasks.**

Jak et al., 2013

Computer-based Training Outcomes

- **Emerging evidence of maintenance of gains over extended follow-up intervals** (Brehmer et al., 2012; Johansson and Tournmalm, 2012; Lundqvist; et al, 2010; Rebok et al., 2014).
- **Processing speed gains are a fairly robust finding with computer based training** (Jak et al., 2013)

Computer-based Training Outcomes

- **Studied predominantly in older adults (mostly healthy)**
- **Some research to support use in HIV, post-chemotherapy, other neurological and psychiatric populations**
- **Limited data on efficacy with TBI, particularly mild TBI. However, populations studied have similar deficits to TBI – attention, memory, processing speed.**

Feasibility

- 70% reported no/little difficulty using program
- Non-"tech-savvy" older adults successfully used computer based training and reported a positive experience
- 58 - 80% maintained average compliance
- Side effects dissipated over time but included fatigue (80%), headaches (20%), and eyestrain (10%).

Lebowitz et al.; 2012; Kueider et al.; 2012, Shatil et al.; 2010

Additional Benefits to Computer-Based Training

- **Expands accessibility**
- **Require fewer resources**
  - Home computer
  - Internet access
  - Basic computer literacy
  - Reduces personnel, space, and travel needs
- **May hold higher entertainment value and appeal more to younger cohorts**
- **Minimal negative side-effects**

Traditional vs. Modern

- Limited investigations of traditional approaches compared to newer computer-based programs.
- Median effect sizes of traditional cognitive training in older adults range from .39 (executive functioning and visual spatial abilities) to 1.30 (processing speed).
- Median effect sizes for computer training ranged from .36 (attention) to 4.0 (processing speed). (Kueider et al., 2012)

Limitations of Current Research

- Lack of an adequate control group
- Limited independent peer-reviewed research
- Long-term follow-up
- Ecologically valid outcome measures
- Small sample sizes
- Large variability in amount of training time
- Samples performing in normal range to begin with

Summary

- Processing speed is one of the domains most robustly impacted by computer based cognitive training; programs may hold promise for improving functioning in this cognitive domain in TBI.
- Computer-based training may be a useful adjunct to formal cognitive rehabilitation and may be particularly applicable to a higher functioning mild TBI population
- Development of new products may have outpaced credible scientific investigation

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