

# Vocational Outcomes of State Voc Rehab Clients with TBI



**MOMBIS**

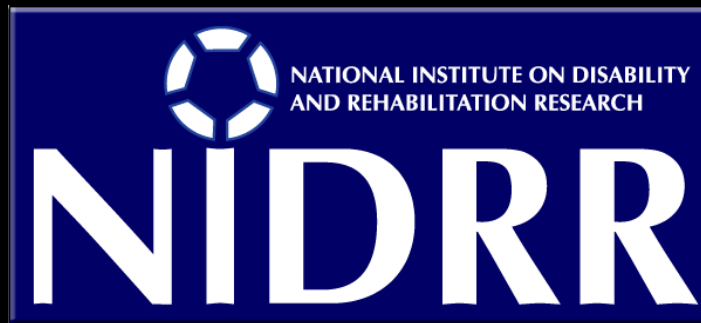
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# Missouri Model Brain Injury System: 1998-2002



**MOMBIS**

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# **MOMBIS Missouri Division of Vocational Rehabilitation (DVR) Project**

- MOMBIS staff collaborated with the Missouri Division of Vocational Rehabilitation (DVR) to follow every state DVR client with a TBI over a 3 year period who completed DVR services.**

# Why Study VR Populations?

- State/provincial VR clients are those persons most in need of assistance in returning to work.**
- VR clients typically have limited means and often require substantial government support.**
- State/provincial VR programs are the primary vehicle by which persons with TBI receive assistance in returning to work.**

## **Data Collected (n = 78)**

- Demographics**
- TBI severity (LOC, PTA, Hospitalization)**
- Neuropsychological functioning**
- DVR services offered**
- DVR outcomes**



# Purpose of the Studies

- ❑ To determine the characteristics of persons who seek DVR services?
- ❑ To determine the best predictors of successful employment outcomes for state VR clients with TBI?
- ❑ To determine if different groups of clients have different employment outcomes?
- ❑ To determine the most important services VR programs should provide?
- ❑ To guide future VR programs.

# **General Findings of the Missouri Model Brain Injury System State Vocational Rehabilitation Project**

# Participant Characteristics

**What are the typical characteristics of persons with TBI who seeks state/provincial VR services?**

# Demographic Characteristics (n = 78)

- **Gender: 71% male; 29% female**
- **Race: 82% Caucasian**
  - 14% African American
  - 4% Other
- **Average age = 36.7 (10.8)**
- **Average education = 11.8 years (2.2)**
- **History of Substance Abuse = 25%**
- **History of Learning Disability = 17%**

# Participant TBI Severity

- **66% hospitalized following TBI**
- **56% reported loss of consciousness**
- **37% reported PTA**
- **Average time since injury = 9.2 years**

# Participant Neuropsychological Data

□ WAIS-3 FIQ =	84.8 (12.3)
□ WMS-3 Immediate Memory =	82.4 (17.4)
□ WMS-3 General Memory =	85.9 (17.9)
□ Category Test =	68 errors (30.6)
□ Trails A =	47'' (28'')
□ Trails B =	122'' (72'')

# “Typical” VR Client

- ❑ **Relatively young, white male**
- ❑ **Limited education**
- ❑ **Fairly significant TBI**
- ❑ **Low average intelligence/memory**
- ❑ **Neuropsychological weaknesses in reasoning, speed, and divided attention**
- ❑ **Many years since TBI**

**How successful are VR clients with TBI in obtaining employment with the assistance of DVR?**



# VR Status at Case Closure

- ❑ **Closed, successful** 17%
- ❑ **Closed, unsuccessful** 10%
- ❑ **Closed, services interrupted** 13%
- ❑ **Closed, no services provided** 60%

**What types of jobs are VR clients with TBI finding?**

# Jobs for Successfully Employed (n = 14)

<input type="checkbox"/> Industrial jobs	7 (50%)
<input type="checkbox"/> Service (i.e., fast food)	2 (14%)
<input type="checkbox"/> Sheltered workshops	2 (14%)
<input type="checkbox"/> Clerical position	1 (7%)
<input type="checkbox"/> Professional position	1 (7%)
<input type="checkbox"/> Unavailable	1 (7%)

**Why do so many VR clients with TBI drop out before services can be started/completed?**

# Reasons for Unsuccessful Closures (n = 64)

<input type="checkbox"/> Client refused services	35
<input type="checkbox"/> Failed to cooperate	11
<input type="checkbox"/> Unable to contact client	4
<input type="checkbox"/> Too severe disability	3
<input type="checkbox"/> Disability not severe enough	2
<input type="checkbox"/> Other	9

# Prediction of Successful Employment

**What are the best predictors of successful employment for DVR clients with TBI?**

# Predictor Variables

- ❑ **Injury severity (loss of consciousness, post-traumatic amnesia, hospitalization)**
- ❑ **Demographics (age, education)**
- ❑ **Neuropsychological test scores**
- ❑ **VR services provided (e.g., job placement, on-the-job training, etc.)**

# Outcome Variable

**Successful Employment through DVR**



# Findings

**Stepwise logistic regression indicated that the only significant predictors ( $p < .0001$ ) of successful employment were:**

- Vocational guidance & counseling ( $p < .0035$ )**
- On-the-job training ( $p < .0009$ )**

# Odds Ratio

- **The odds of having successful closure was 14.12 higher if counseling/guidance were provided.**
- **The odds of having successful closure was 15.70 times higher if on-the-job training was provided.**

# Conclusions

**The provision of specific VR services appear to be more important in determining vocational outcomes than demographic variables and indices of injury severity (i.e., medical and neuropsychological).**

# DVR Subgroups

**What are the employment outcomes for different subgroups of VR clients with TBI?**

- Gender**
- Race**
- Age**
- Rural/urban status**
- Multiple disability status**

# Vocational Outcomes for MO-DVR Clients by Urban/Rural Status

# Injury Severity Table

## Demographic and Injury Severity Data by Urban/Rural Status.

	Rural (n=28)	Urban (n=50)
Age (years)	37.1 (10.1)	36.1 (11.9)
Education (years)	12.0 (2.2)	11.5 (2.2)
Time Since Injury (years)	8.3 (9.7)	10.8 (9.2)
LOC (hours)	241.4 (385.7)	96.0 (174.3)
PTA (days)	53.1 (147.3)	25.2 (18.3)
Hospitalization (days)	53.2 (83.1)	32.9 (37.4)

# Neuropsychological Test Scores by Urban/Rural Status

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Test	<u>n</u>	<u>Rural</u> Score	<u>n</u>	<u>Urban</u> Score
<b>WAIS-III:</b>				
VIQ	28	86.9 (10.1)	48	86.6 (12.9)
PIQ	28	88.8 (12.3)	49	82.6 (14.1)
FIQ	28	86.6 (10.8)	48	83.8 (13.0)
<b>WMS-III:</b>				
Visual Immediate	25	85.0 (16.9)	46	83.5 (13.9)
Auditory Immediate	25	90.1 (16.5)	45	84.6 (16.9)
Immediate Memory	25	85.1 (18.8)	45	80.9 (16.6)
Visual Delay	25	85.6 (19.8)	46	84.2 (15.5)
Auditory Delay	25	91.9 (17.8)	45	86.0 (17.6)
Auditory/Recognition Delay	24	95.8 (14.6)	44	89.5 (20.1)
General Memory	25	89.6 (17.4)	44	83.8 (18.0)
Working Memory	1	99.0	35	86.5 (15.4)
<b>WJ-R:</b>				
Broad Reading	28	92.5 (11.9)	38	90.0 (16.2)
Broad Math	27	87.5 (12.1)	39	84.7 (12.4)
Broad Written Language	26	80.5 (14.6)	39	78.8 (16.0)

# Neuropsychological Test Scores by Urban/Rural Status - Continued

Test	<u>Rural</u>		<u>Urban</u>	
<u>n</u> Score	<u>n</u>	<u>Score</u>	<u>n</u>	<u>Score</u>
Category Test Errors	27	73.6 (30.2)	34	64.2 (30.8)
Trail Making Test				
Part A	28	41.3" (17.5")	50	49.9" (25.6")
Part B	28	98.1" (43.0")	50	134.8" (81.0")
Grip Strength				
Dominant	24	36.2 (14.3)	39	33.0 (11.5)
Non-Dominant	25	35.8 (14.4)	38	32.8 (11.5)
Finger Tapping				
Dominant	25	40.6 (9.8)	42	39.8 (11.6)
Non-Dominant	25	40.8 (7.2)	41	37.5 (10.9)
Grooved Pegboard				
Dominant	24	91.0" (31.2")	39	104.1" (51.3")
Non-Dominant	24	89.3" (20.0")	41	120.7" (61.0")

\*=p<.05 \*\* = p<.01



# Vocational Services Provided by Urban/Rural Status

Percentage of Urban and Rural Missourians Receiving Specific MO-DVR Services.

MO-DVR Service	Rural Missourians Receiving Services	Urban Missourians Receiving Services
Assessment	82.1%	90.0%
Vocational Counseling and Guidance	21.4%	40.0%
Maintenance	21.4%	46.0%*
Transportation	10.7%	36.0%*
On-the-Job Training	7.1%	28.0%*
Post-Secondary Training	7.1%	4.0%
Job Placement	3.6%	10.0%
Personal/Vocational Adjustment	3.6%	6.0%
Job Referral	0.0%	0.0%
Other Services	14.29%	12.0%

# Vocational Status at Closure by Urban/Rural Status

## Vocational Status at Closure by Residency.

Vocational Status	Rural Missourians	Urban Missourians
Closed after referral to DVR, but before case was accepted	7.1%	12.0%
Closed after acceptance by DVR, but before services were initiated	78.6%	52.0%
Services initiated by DVR, but were unsuccessful	7.1%	12.0%
Closed successfully	7.1%	24.0%

# **Rural-Urban DVR Outcomes Conclusions**

**Rural and urban DVR clients have similar:**

- TBI characteristics**
- Neuropsychological test scores**
- Demographic characteristics**

# Rural/Urban Summary

**Rural and Urban DVR clients differ in terms of:**

- ❑ DVR services offered (more to urban)**
- ❑ Successful employment outcomes (better in urban)**

## **Rural/Urban Summary continued**

**Rural clients may receive less DVR services and have poorer outcomes because of environmental factors including:**

- Limited job opportunities in rural areas**
- Limited access to rehabilitation services/professionals**
- Other environmental factors (e.g., limited transportation opportunities, etc.)**

# Vocational Outcomes for MO-DVR Clients by Gender

# Demographic and Injury Severity Data by Gender

## Demographic and Injury Severity Data by Gender.

	Female (n=23)	Male (n=55)
Age (years)	38.1 (11.2)	36.1 (10.6)
Education (years)	12.3 (2.0)	11.6 (2.2)
Time Since Injury (years)	10.0 (11.2)	8.9 (8.8)
LOC (hours)	259.4 (453.0)	120.4 (235.3)
PTA (days)	85.6 (202.0)	13.0 (16.1)
Hospitalization (days)	57.1 (51.4)	46.5 (81.8)

# Neuropsychological Test Results by Gender

Test		Female		Male	
		n	Score	n	Score
WAIS-III:	VIQ	22	89.7 (13.5)	54	85.5 (11.1)
	PIQ	22	88.4 (14.1)	55	83.4 (13.4)
	FIQ	22	88.2 (13.0)	54	83.4 (11.8)
WMS-III:	Visual Immediate	23	88.1 (15.6)	48	82.1 (14.3)
	Auditory Immediate	23	90.4 (18.6)	47	84.7 (15.8)
	Immediate Memory	23	86.9 (19.5)	47	80.1 (16.1)
	Visual Delay	23	91.5 (16.2)	48	81.4 (16.6)
	Auditory Delay	23	94.0 (18.4)	47	85.3 (17.0)
	Auditory/Recognition Delay	23	93.3 (18.7)	45	91.0 (18.5)
	General Memory	23	91.7 (18.3)	46	83.0 (17.2)
	Working Memory	13	93.0 (15.3)	23	83.4 (14.4)
WJ-R:	Broad Reading	18	95.6 (12.2)	49	87.5 (19.6)
	Broad Math	19	87.1 (11.8)	47	85.4 (12.5)
	Broad Written Language	19	86.7 (12.5)	46	76.5 (15.6)**
Category Test Errors		17	67.5 (28.2)	44	68.7 (31.8)
Trail Making Test	Part A	23	40.6" (17.5")	55	49.5" (31.2")
	Part B	23	98.3" (56.3")	55	131.3" (75.5")
Grip Strength	Dominant	18	23.1 (8.9)	45	38.6 (11.1)***
	Non-Dominant	18	20.4 (7.9)	45	39.4 (9.8)***
Finger Tapping	Dominant	18	34.7 (10.9)	49	42.0 (10.3)**
	Non-Dominant	19	32.5 (11.4)	47	41.3 (7.8)**
Grooved Pegboard	Dominant	19	96.1 (31.3)	44	100.5 (49.9)
	Non-Dominant	18	107.2 (54.9)	48	109.4 (51.0)

\*\* = p<.01 \*\*\* = p<.001



# Vocational Status at Closure by Gender

## Vocational Status at Closure by Gender.

Vocational Status	Percentage of Females	Percentage of Male
Closed after referral to DVR, but before case was accepted	2.0%	10.9%
Closed after acceptance by DVR, but before services were initiated	73.9%	56.4%
Services initiated by DVR, but were unsuccessful	13.0%	9.1%
Closed successfully	4.4%	23.6%

# Summary

- ❑ **Men and women with TBI receive different VR services and have different vocational outcomes despite having similar injury severity, demographics, and neuropsychological test scores.**
- ❑ **Differences may be related to different societal expectations (e.g., primary homemaker, parent), or expectations for different vocational outcomes.**

# Vocational Outcomes for MO-DVR Clients by Racial Status

# Demographic and Injury Severity by Race

Demographic and Injury Severity Data by Race.

	<u>African-American</u>		<u>Caucasian</u>	
	<u>n</u>	<u>Mean (SD)</u>	<u>n</u>	<u>Mean (SD)</u>
Age (years)	13	40.4 (11.1)	62	35.3 (10.3)
Education (years)	13	11.2 (1.8)	61	11.9 (2.1)
Time Since Injury (years)	13	11.4 (9.9)	60	9.0 (9.5)
Time Unemployed (years)	13	5.9 (7.6)	61	2.1 (2.8)*
LOC (hours)	9	237.3 (472.4)	33	198.5 (314.2)
PTA (hours)	5	18.2 (24.7)	22	55.0 (150.2)
Hospitalization (days)	10	38.9 (28.2)	40	51.5 (82.8)

Loss of consciousness (LOC); Post-traumatic amnesia (PTA); Time unemployed = years unemployed before requesting VR services.

\*=p<.01

# Neuropsychological Test Data by Race

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## Neuropsychological Test Results by Race

Test	<u>African-American</u>		<u>Caucasian</u>	
	n	Mean (SD)	n	Mean (SD)
WAIS-III:				
VIQ	12	83.8 (12.5)	62	87.3 (12.1)
PIQ	13	78.8 (12.9)	62	86.5 (13.6)
FIQ	12	80.7 (13.0)	62	85.8 (12.3)
WMS-III:				
Visual Immediate	12	82.8 (14.7)	56	84.8 (15.3)
Auditory Immediate	11	78.6 (17.8)	56	88.3 (16.7)
Immediate Memory	11	76.7 (17.3)	56	83.8 (17.8)
Visual Delay	12	81.2 (15.2)	56	85.7 (17.6)
Auditory Delay	11	81.1 (18.2)	56	89.6 (18.0)
Auditory/Recognition Delay	10	87.0 (21.0)	56	92.9 (18.3)
General Memory	10	80.1 (18.5)	56	87.3 (18.1)
WJ-R:				
Broad Reading	11	88.3 (18.4)	52	92.4 (13.6)
Broad Math	10	85.5 (18.3)	53	86.3 (10.9)
Broad Written Language	10	80.0 (19.1)	52	80.0 (14.5)

# Neuropsychological Test Data by Race

## Continued

### Neuropsychological Test Results by Race

Test	African-American		Caucasian	
	n	Mean (SD)	n	Mean (SD)
Category Test Errors	10	86.0 (28.5)	48	63.2 (28.9)*
Trail Making Test (seconds)				
Part A	13	58.1 (36.4)	62	43.0 (24.8)
Part B	13	173.8 (97.8)	62	106.4 (58.0)**
Grip Strength				
Dominant	9	36.3 (8.1)	51	33.8 (13.4)
Non-Dominant	10	36.7 (6.3)	51	34.2 (13.3)
Finger Tapping				
Dominant	10	46.3 (8.8)	54	38.8 (11.1)
Non-Dominant	11	44.0 (8.2)	54	38.1 (9.5)
Grooved Pegboard				
Dominant	9	97.1 (37.4)	51	100.4 (47.5)
Non-Dominant	11	121.9 (50.5)	53	103.7 (51.3)

\*=p<.05; \*\* = p<.01

# Specific DVR Services by Race

Table 4: Percentage of African-Americans and Caucasians Receiving Specific MO-DVR Services

MO-DVR Service	Percent of African-Americans Receiving the Service	Percent of Caucasians Receiving the Service
Assessment	92.3%	87.1%
Vocational Counseling and Guidance	30.8%	30.7%
Maintenance	61.5%	32.3%
Transportation	61.5%	21.0%*
On-the-Job Training	30.8%	19.4%
Post-Secondary Training	0.0%	6.5%
Job Placement	15.4%	6.5%
Personal/Vocational Adjustment	15.4%	3.2%
Job Referral	0.0%	0.0%
Other Services	0.0%	16.1%
Cost per case	\$1,694 (1,432)	\$1,643 (2,344)

\* =  $p < .01$

# Vocational Status by Race

## Vocational Status at Closure by Race.

Vocational Status	Percentage of African-Americans	Percentage of Caucasians
Closed, no services provided	15.4%	9.7%
Closed, services interrupted	53.9%	62.9%
Closed, unsuccessful	7.7%	9.7%
Closed, successfully	23.1%	17.7%



# Racial Status Summary

- ❑ African American and Caucasian VR clients have similar vocational outcomes
- ❑ African American VR clients received more VR services, possibly related to their primarily urban status.
- ❑ MO-DVR is doing a good job of serving minority clients.

# MO-DVR Vocational Outcomes by Age

# Demographic and Injury Severity Data by Age

## Demographic and Injury Severity Data by Age

Variable	Age Group		
	<30 (n=22)	30-44 (n=30)	>44 (n=24)
Gender (men/women)	17/5	21/9	15/9
Age	23.4 (3.6)	36.4 (3.7)	49.2 (3.8)
Ethnicity (Cauc./A.A./other/Missing)	19/2/0/1	25/4/0/1	12/6/3/3
Education (years)	11.0 (1.8)	12.2 (2.0)	11.9 (2.5)
Single (never married)	90.5%*	31.0%	25.0%
Married	4.8%*	44.8%	29.2%
Divorced	4.8%*	20.7%	45.8%
Substance Abuse	45.5%	13.3%	16.7%*
Time Since Injury (years)	6.9 (8.1)	9.5 (8.9)	11.0 (11.4)
LOC (hours)	196.3 (261.2)	275.8 (382.6)	114.9 (381.8)
PTA (days)	22.8 (17.5)	16.4 (22.1)	18.3 (21.1)
Hospitalization (days)	37.8 (37.1)	46.5 (48.6)	31.1 (34.4)

Note. Unless otherwise noted, values are means (and standard deviations). Cauc. = Caucasian; A.A. = African-American; LOC = loss of consciousness; PTA = post-traumatic amnesia. \*The youngest group was significantly different from the other two groups at  $p < .05$ .

# Neuropsychological Test Results by Age

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## Neuropsychological Test Results by Age.

Test	Age Group					
	<30		30-44		>44	
	n	Score	n	Score	n	Score
<u>WAIS-III:</u>						
VIQ	21	85.4 (9.0)	30	89.4 (12.7)	23	84.7 (11.5)
PIQ	22	84.0 (13.0)	30	87.6 (14.7)	23	83.1 (12.6)
FIQ	21	84.0 (10.2)	30	87.5 (12.8)	23	82.7 (11.9)
<u>WMS-III:</u>						
Visual Immediate	19	85.8 (15.9)	27	83.8 (13.1)	23	84.2 (15.7)
Auditory Immediate	19	86.2 (17.4)	27	88.9 (16.5)	22	85.3 (16.1)
Immediate Memory	19	83.1 (17.5)	27	83.7 (16.7)	22	81.6 (17.9)
Visual Delay	19	83.3 (17.4)	27	84.8 (15.2)	23	87.3 (18.3)
Auditory Delay	19	86.5 (18.4)	27	90.1 (17.9)	22	88.2 (16.9)
Auditory/Recognition Delay	19	93.7 (15.7)	26	95.0 (18.3)	21	87.6 (19.9)
General Memory	19	84.6 (16.8)	26	88.5 (17.0)	22	85.8 (19.0)
<u>WJ-R:</u>						
Broad Reading	20	91.6 (15.2)	25	91.6 (15.2)	21	94.0 (15.1)
Broad Math	19	83.9 (9.7)	24	87.4 (11.6)	22	86.8 (14.6)
Broad Written Language	19	78.6 (13.1)	24	79.4 (16.2)	21	82.1 (15.1)

# Neuropsychological Test Results by Age Continued

Test	Age Group					
	<30		30-44		>44	
	n	Score	n	Score	n	Score
<u>Category Test Errors</u>	17	61.8 (29.6)	25	64.5 (26.9)	18	81.9 (33.7)
<u>Trail Making Test</u>						
Part A	22	43.2" (25.5")	30	44.9" (26.5")	24	47.3" (22.7")
Part B	22	106.5" (48.2")	30	96.9" (57.0")	24	161.5" (82.1")*
<u>Grip Strength</u>						
Dominant	16	36.9 (13.3)	24	31.9 (14.0)	22	34.5 (10.7)
Non-Dominant	18	35.1 (11.0)	23	35.9 (14.3)	21	30.3 (12.0)
<u>Finger Tapping</u>						
Dominant	18	37.6 (11.2)	26	39.6 (10.3)	22	43.3 (10.9)
Non-Dominant	20	38.9 (9.0)	25	37.7 (9.9)	20	40.4 (10.5)
<u>Grooved Pegboard</u>						
Dominant	18	113.5" (55.2")	23	87.2" (18.7")	21	90.3 (28.9)
Non-Dominant	19	113.1" (65.3")	26	104.9" (44.5")	20	106.8 (47.4)

Note. Score values are means (and standard deviations). WAIS-III = Wechsler Adult Intelligence Scale – 3rd ed.; WMS-III = Wechsler Memory Scale – 3rd ed.; WJ-R = Woodcock-Johnson – Revised.

\*The oldest group was significantly different from the other two groups at  $p < .05$ .

# Specific DVR Services by Age

## Percentage of Participants Receiving Specific MO-DVR Services

MO-DVR Service	Age Group		
	<30	30-44	>44
Assessment (completed medical, Psychological, social, & Vocational diagnostic services)	100%	76.7%	87.5%
Vocational Counseling and Guidance	36.4%	33.3%	29.2%
Maintenance (provision of basic living expenses)	41.0%	33.3%	37.5%
Transportation	31.8%	23.3%	25.0%
On-the-Job Training	18.2%	23.3%	12.5%
Post-Secondary Training	9.1%	6.7%	0.0%
Job Placement	4.6%	10.0%	4.2%
Personal/Vocational Adjustment	4.6%	6.7%	0.0%
Job Referral	0.0%	0.0%	0.0%
Other Services (services not Covered by other categories, Such as attendant care, Interpreters, child care, and occupational licenses)	18.2%	20.0%	0.0%*

Note. MO-DVR = Missouri-Division of Vocational Rehabilitation.

\*The oldest group was significantly different from the other two groups at  $p < .05$ .

# Vocational Status by Age

## Percentages of Vocational Status at Closure by Age.

Vocational Status	Age Group		
	<30	30-44	>44
Closed after referral to DVR, but before case was accepted	0.0%	23.3%	4.2%
Closed after acceptance by DVR, but before services were initiated	72.7%	46.7%	75.0%
Services initiated by DVR, but were unsuccessful	13.6%	10.0%	8.3%
Closed successfully	13.6%	20.0%	12.5%

# Summary for Age

- ❑ **DVR clients with TBI and different age groups have similar demographic, injury severity, and neuropsychological characteristics.**
- ❑ **Individuals of all ages appear to benefit equally from DVR services.**



# **Vocational Outcomes for MO-DVR Clients with Multiple Disabilities**

# **Multiple Disability Groups (n = 138)**

**TBI Only**

**TBI + Orthopaedic Injury**

**TBI + Seizure**

**TBI + Psychological History**

**TBI + Learning Disability**

# Demographics for Multiple Disability Groups

## Group Characteristics

TBI ONLY GROUP vs. EACH OTHER GROUP	TBI ONLY ( <i>n</i> =39)	TBI & ORTHO ( <i>n</i> =26)	TBI & SEIZURE ( <i>n</i> =38)	TBI & PSYCH ( <i>n</i> =18)	TBI & LD ( <i>n</i> =25)
Age (Years; <i>M, SD</i> )	33.8 (11.3)	36.7 (11.3)	34.4 (10.0)	38.6 (11.1)	32.2 (9.9)
Education (Years; <i>M, SD</i> )	12.2 (2.4)	12.2 (1.7)	12.1 (1.1)	11.7 (1.9)	10.5* (1.7)
PTA (Hours, <i>M, SD</i> )	19.8 (22.2)	23.8 (18.7)	18.5 (17.1)	19.4 (19.7)	88.1 (237.1)
Hospitalization (Days, <i>M, SD</i> )	40.6 (44.4)	58.5 (56.1)	55.5 (97.4)	19.1 (16.9)	46.1 (67.5)
Time Since Injury (Years, <i>M, SD</i> )	6.5 (8.1)	9.8 (10.0)	9.1 (9.9)	11.3 (9.6)	11.9* (9.2)

\*  $p < 0.03$

# Neuropsychology Test Results by Multiple Disability Groups

Neuropsychological Test Results by Group (1 of 6 slides)

WAIS-III FSIQ	<u>n</u>	Mean	SD
TBI Only	38	90.2	12.8
TBI & Ortho	26	92.5	14.3
TBI & Seizure	37	85.0	16.1
TBI & Psych	18	85.1	13.5
TBI & LD	25	80.6	8.0*

\* Significantly Different from TBI Only group  $p < 0.01$

# Neuropsychology Test Results by Multiple Disability Groups - Continued

Neuropsychological Test Results by Group (2 of 6 slides)

WAIS-III	<u>n</u>	Mean	SD
Auditory Immediate			
TBI Only	37	90.8	14.2
TBI & Ortho	25	96.2	12.7
TBI & Seizure	33	85.8	17.8
TBI & Psych	16	90.6	15.7
TBI & LD	24	82.3	17.5
Auditory Delayed			
TBI Only	37	90.9	17.1
TBI & Ortho	25	98.4	13.7
TBI & Seizure	33	86.7	16.8
TBI & Psych	16	96.6	13.2
TBI & LD	24	84.1	16.8

# Neuropsychology Test Results by Multiple Disability Groups - Continued

## Neuropsychological Test Results by Group (3 of 6 slides)

WMS-III	<u>n</u>	Mean	SD
Visual Immediate			
TBI Only	37	86.7	14.1
TBI & Ortho	26	85.7	11.8
TBI & Seizure	33	80.3	14.8
TBI & Psych	17	92.1	14.1
TBI & LD	24	81.0	14.4
Visual Delayed			
TBI Only	37	88.0	17.6
TBI & Ortho	26	87.9	15.0
TBI & Seizure	33	81.2	15.9
TBI & Psych	17	93.1	14.3
TBI & LD	24	83.0	14.4

# Neuropsychology Test Results by Multiple Disability Groups - Continued

Neuropsychological Test Results by Group (4 of 6 slides)

WJ-R	<u>N</u>	Mean	SD
Broad Reading			
TBI Only	34	97.1	14.0
TBI & Ortho	24	91.5	17.7
TBI & Seizure	33	88.8	19.1
TBI & Psych	17	90.2	20.2
TBI & LD	23	82.8	12.6*
Broad Math			
TBI Only	35	91.2	14.7
TBI & Ortho	24	88.9	20.3
TBI & Seizure	33	86.8	12.1
TBI & Psych	18	87.9	8.7
TBI & LD	23	81.5	10.1*
Broad Written Language			
TBI Only	33	86.8	14.6
TBI & Ortho	24	84.7	18.6
TBI & Seizure	32	76.6	18.0
TBI & Psych	17	76.8	18.6
TBI & LD	23	72.4	15.3*

\*Significantly different from TBI only group  $p < 0.01$

# Neuropsychology Test Results by Multiple Disability Groups - Continued

Neuropsychological Test Results by Group (5 of 6 slides)

Category Test Errors	<u>n</u>	Mean	SD
TBI Only	32	61.6	30.1
TBI & Ortho	23	60.2	32.7
TBI & Seizure	26	63.6	33.8
TBI & Psych	12	69.1	34.3
TBI & LD	19	75.5	34.5



# Neuropsychology Test Results by Multiple Disability Groups - Continued

Neuropsychological Test Results by Group (6 of 6 slides)

Trail Making Test	<u>n</u>	Mean	SD
A			
TBI Only	38	45.2	24.2
TBI & Ortho	26	37.3	16.8
TBI & Seizure	38	49.0	34.0
TBI & Psych	18	42.0	14.4
TBI & LD	25	40.8	15.9
B			
TBI Only	37	104.3	68.8
TBI & Ortho	26	98.1	59.1
TBI & Seizure	38	124.2	75.2
TBI & Psych	18	107.4	63.5
TBI & LD	25	123.5	69.6

# Vocational Status by Multiple Disability Group

## Vocational Status at Case Closure By Group

Status at Case Closure	TBI ONLY (n =39)	TBI & ORTHO (n =26)	TBI & SEIZURE (n =38)	TBI & PSYC (n =18)	TBI & LD (n =25)
Successful	25.6%	23.1%	31.6%	11.1%	8.0%
Unsuccessful	10.2%	11.5%	7.9%	16.7%	24.0%
Services Interrupted	53.9%	65.4%	57.9%	72.2%	60.0%
No Services Provided	10.3%	0.0%	2.6%	0.0%	8.0%

# Multiple Disability Summary

- **Persons with TBI and concomitant psychological/academic disabilities appear to have significantly worse vocational outcomes than persons with TBI only or TBI and physical disabilities.**

# Multiple Disability Conclusions

- **State/Provincial DVR programs should consider increasing psychological services to clients with TBI and associated psychological services.**

# Future Directions for DVR Programs

- ❑ **Improve time from TBI until referral to DVR.**
- ❑ **Decrease attrition rate of DVR clients.**
- ❑ **Increase emphasis on interventions vs. assessment.**
- ❑ **Increase work-site interventions.**
- ❑ **Address role of environmental factors (e.g., transportation).**

# Future Directions for DVR Programs

- ❑ **Consider using new and innovative services (e.g., telehealth, telework opportunities, etc.).**
- ❑ **Better address the psychological and academic disabilities co-occurring with TBI.**
- ❑ **Address co-occurring substance abuse issues.**
- ❑ **Work with state/provincial Disability Determinations programs to determine most appropriate populations with which to work**

# Future Research

**Convince federal rehabilitation research and training programs to prioritize research that improves employment outcomes of persons with TBI. Emphasize the need to conduct interventions in work sites, rather than conducting research focused on predicting employment outcomes.**