

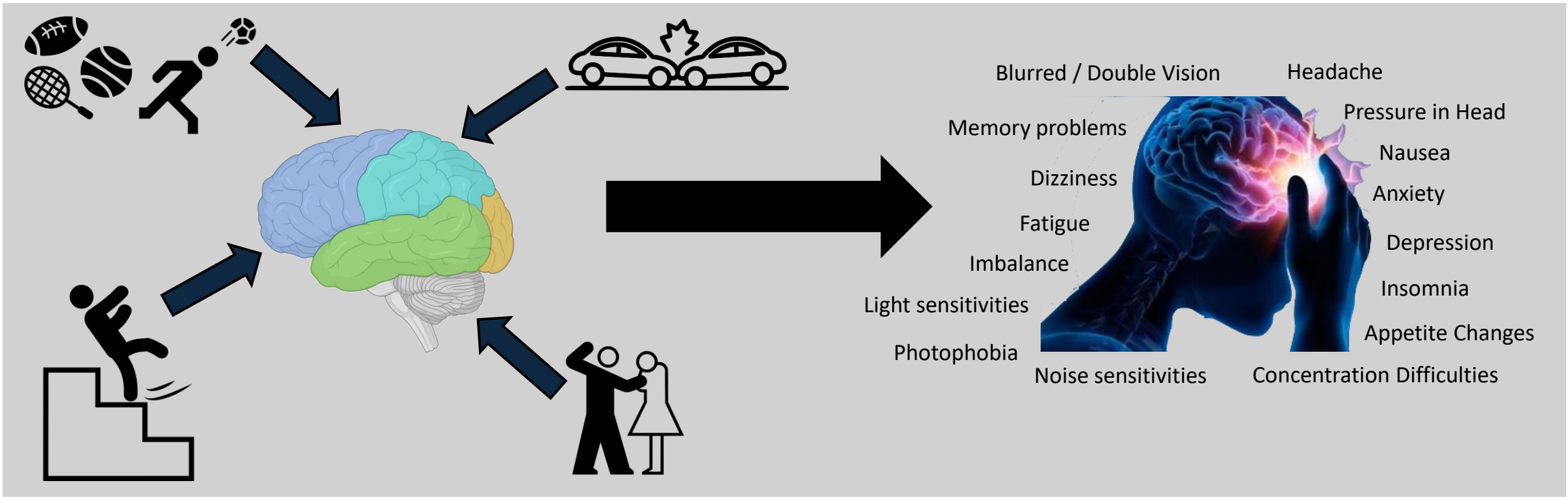
# Relationship Between Cause of Concussion and Long-Term Recovery in a Longitudinal Cohort of 600 Patients

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# The Causes of Concussion

# Persisting Concussion Symptoms (PCS)



# Objectives

Does the cause of concussion affect the long-term recovery and the type and number of symptoms in patients with concussion + PCS?

# Methods

## Study Design & Subjects

- Retrospective, longitudinal study of 600 patients referred to the Canadian Concussion Center at Toronto Western Hospital, 2000-2018.

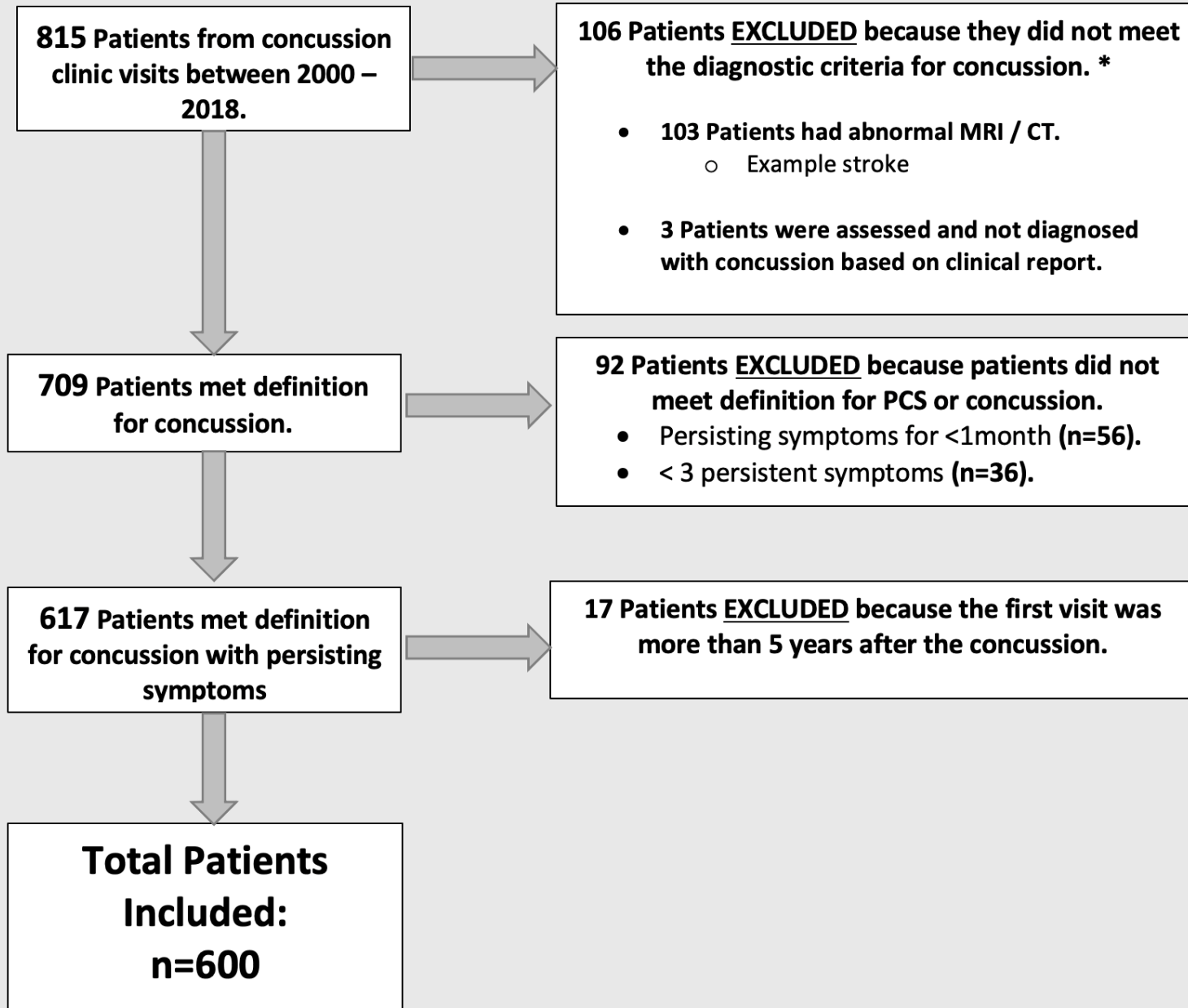


## Data Collection

- Demographic and clinical characteristics extracted from patients' clinical charts and returned questionnaires.



# Patient Inclusion & Exclusion Criteria



## Recovery from Concussion + PCS (n=600): Known Complete Recovery, Known Incomplete Recovery, and Unknown Recovery

	Known Complete Recovery	Known Incomplete Recovery	Unknown Recovery
<b>Number of Concussion + PCS Patients n=600 n (%)</b>	60 (10.0%)	408 (68.0%)	132 (22.0%)
<b>Time (months) from Index Concussion to First Visit (median [IQR])</b>	3.00 [1.00, 6.50]	5.00 [2.00, 12.00]	8.00 [4.00, 18.00]
<b>Time (months) to Complete Recovery (median [IQR])</b>	8 [3.5,18.0]	--	--

# Demographic Features of C+PCS Patients in the Four Causes of Concussion Groups (n=600)

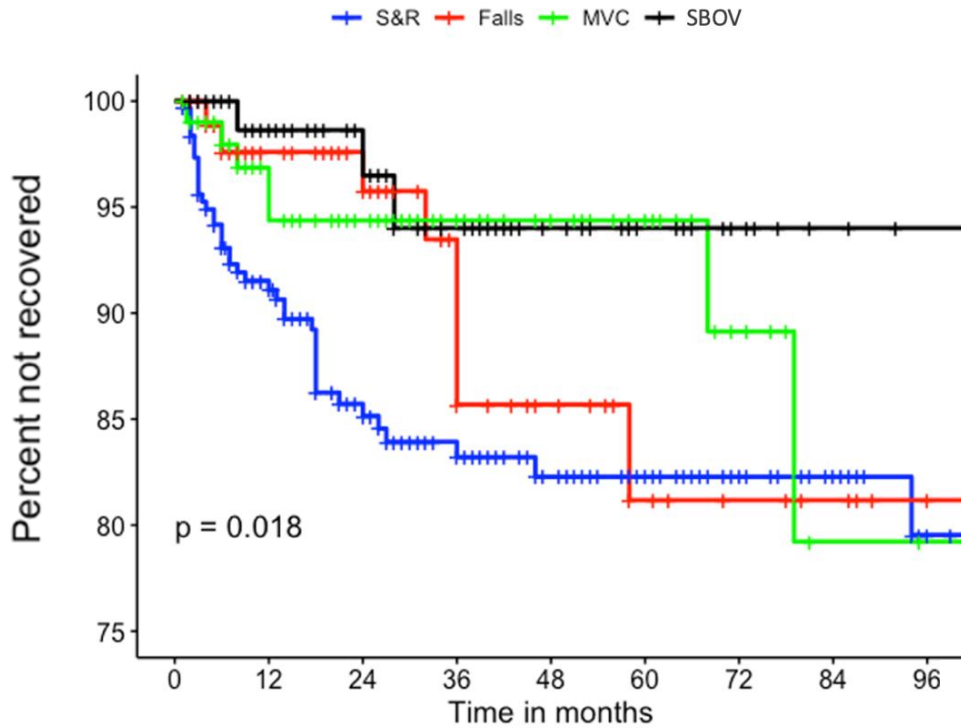
	S&R (n=312, 52%)	MVC (n=103, 17%)	Falls (n=100, 17%)	SBOV (n=85, 14%)	Total (n=600, 100%)	P Value
<b>Age (years) median [IQR]</b>	20.0 [17.0,30.0]	40.0 [30.5,49.0]	46.0 [29.0,56.0]	39.0 [23.0,53.0]	29.0 [18.0, 45.0]	<b>&lt;0.001</b>
<b>Sex – Female n (%)</b>	130 (41.7)	78 (75.7)	68 (68.0)	53 (62.4)	329 (54.8)	<b>&lt;0.001</b>
<b>Previous Concussions median [IQR]</b>	2.00 [1.00, 3.00]	0.00 [0.00, 2.00]	1.00 [0.00, 2.00]	0.00 [0.00, 2.00]	1.00 [0.00, 3.00]	<b>&lt;0.001</b>
<b>Previous Psychiatric Conditions n (%)</b>	35 (11.2)	24 (23.3)	19 (19.0)	21 (24.7)	99 (16.5)	<b>0.002</b>
<b>History of Migraine n (%)</b>	30 (9.6)	25 (24.3)	19 (19.0)	17 (20.0)	91 (15.2)	<b>0.001</b>

## Association of Cause of Concussion with Symptoms and Recovery (n=600)

	S&R (n=312, 52%)	MVC (n=103, 17%)	Falls (n=100, 17%)	SBOV (n=85, 14%)	P Value
<b>Total Number of PCS Symptoms (median [IQR])</b>	8.0 [5.0, 12.0]	11.0 [8.5, 15.0]	8.0 [6.0, 12.0]	10.0 [6.0, 15.0]	<b>&lt;0.001</b>
<b>Known Number of Patients with Complete Recovery (n=60)</b>	42 (13.5%)	7 (6.8%)	8 (8.0%)	3 (3.5%)	<b>0.021</b>

# Kaplan-Meier Curves for Complete Recovery Over 96 Month Follow-Up (n=600)

## A) All Four Causes

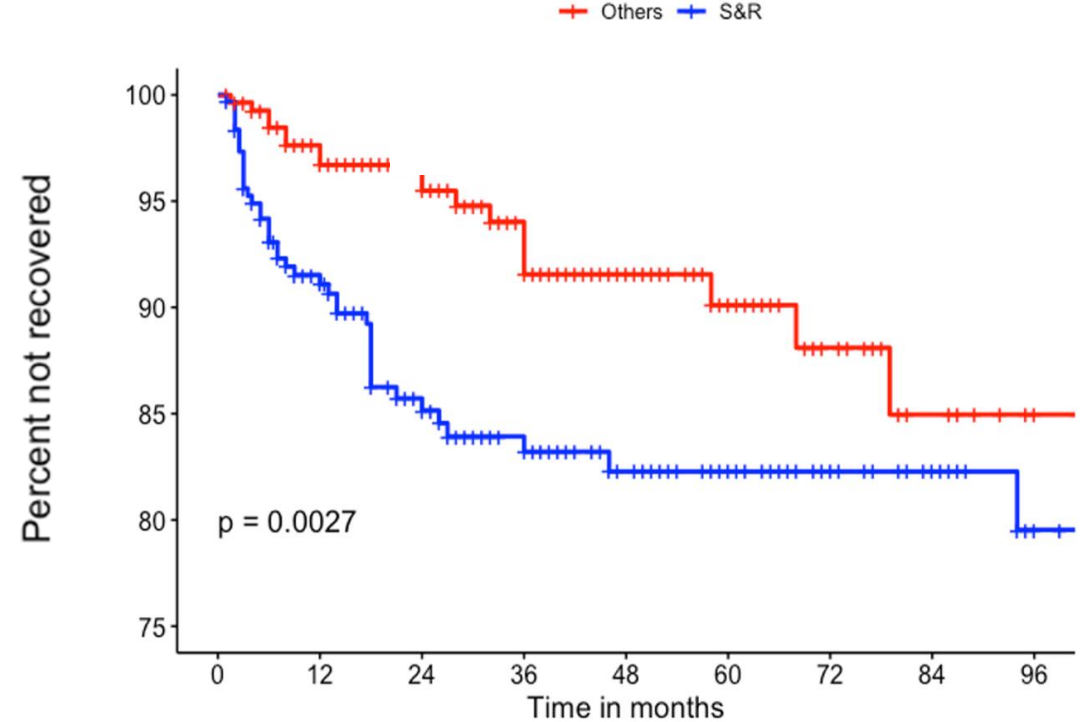


Number at risk

	0	12	24	36	48	60	72	84	96
S&R	312	210	150	117	82	62	46	38	25
Falls	100	66	53	36	25	16	13	11	8
MVC	103	78	60	45	32	24	13	7	6
SBOV	85	66	46	33	23	16	11	6	4

Time in months

## B) S&R vs the Other Three Causes



Number at risk

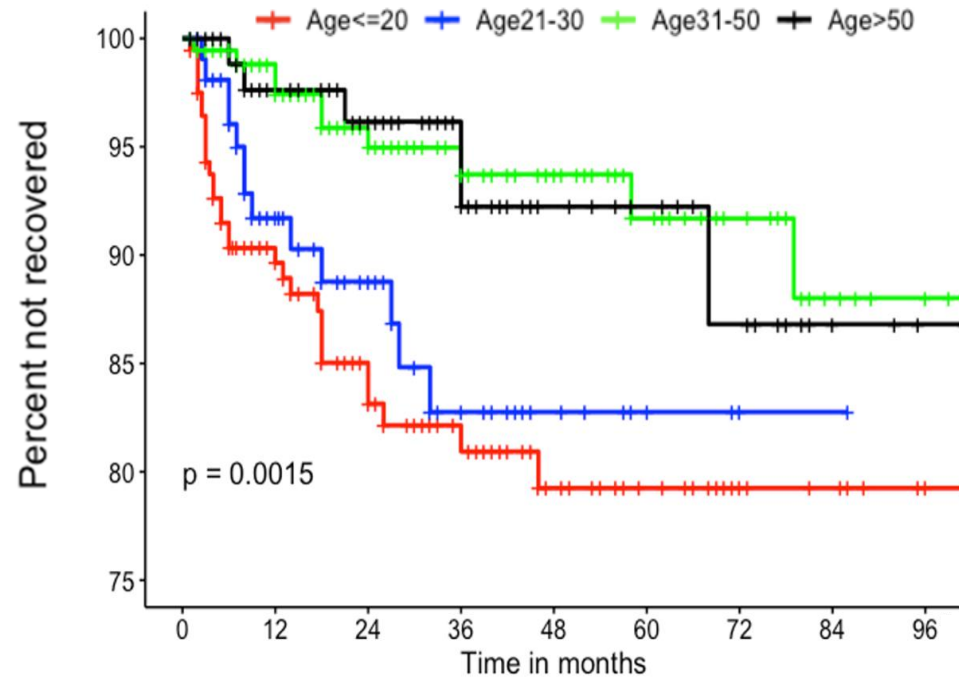
	0	12	24	36	48	60	72	84	96
Others	288	210	159	114	80	56	37	24	18
S&R	312	210	150	117	82	62	46	38	25

Time in months



# Kaplan-Meier Curves for Complete Recovery Over 96 Month Follow-Up (n=600)

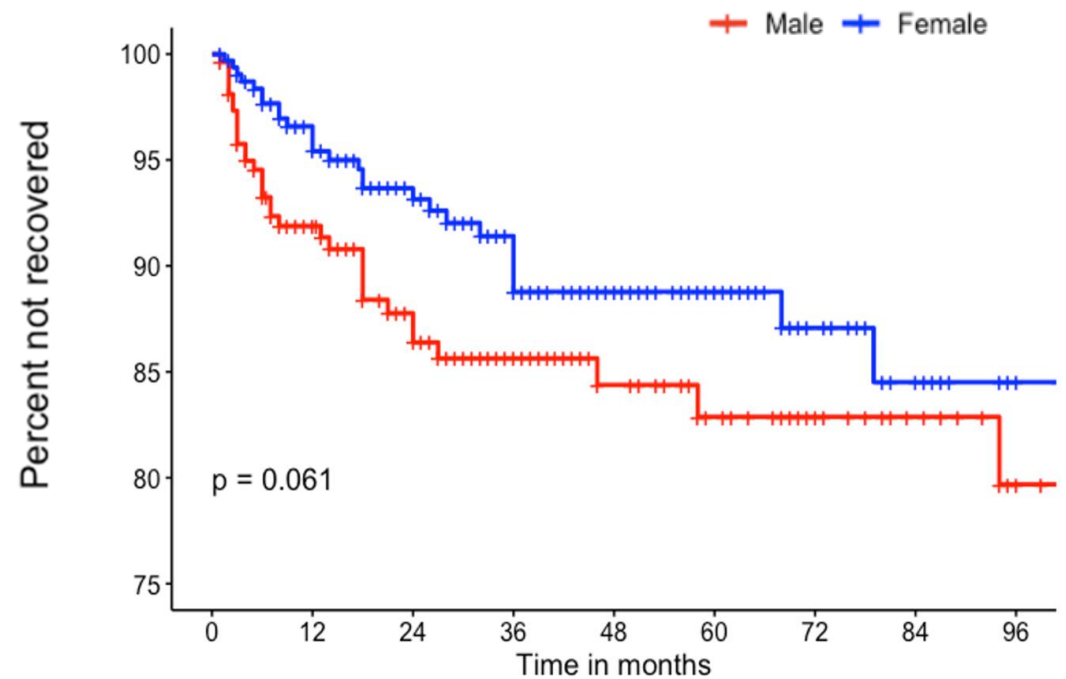
## C) Age Groups



Number at risk

	0	12	24	36	48	60	72	84	96
Age <=20	203	132	90	68	45	32	22	19	13
Age 21-30	112	69	51	37	26	18	13	12	6
Age 31-50	184	145	105	77	59	44	32	21	17
Age >50	99	73	63	49	32	24	16	10	7

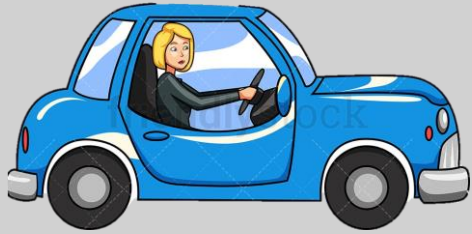
## D) Males vs Females



Number at risk

	0	12	24	36	48	60	72	84	96
Male	271	175	127	92	63	50	40	31	23
Female	329	245	182	139	99	68	43	31	20

# Conclusions



**Worst**  
Outcome  
for  
Recovery

MVC: females & older age



**Best**  
Outcome  
for  
Recovery

S&R: males & younger age

# Key Findings:

- Cause of concussion is associated with type, number & duration of symptoms.
- All causes of concussion produced prolonged symptoms.
- Not everyone recovers.
  - Only 60 (10%) of the patients had complete recovery.
- **Our study emphasizes the importance of concussions as a public health concern necessitating improved prevention and treatment strategies.**

# Our **Manuscript Has Recently Been Published** in the Journal of Neurotrauma

ORIGINAL ARTICLE

CLINICAL STUDIES

## Cause of Concussion With Persisting Symptoms Is Associated With Long-Term Recovery and Symptom Type, Duration, and Number in a Longitudinal Cohort of 600 Patients

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