Interactions Between Gender and Other Risk Factors Are Associated with Persistent Neck Pain after Motor Vehicle Collision

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Trauma Recovery: Understanding Mechanisms & Promoting Healing

INTRODUCTION

- Persistent moderate or severe neck pain (MSNP) after motor vehicle collision (MVC) is an international public health problem.[1,2]
- Increasing evidence suggests that important differences may exist in the pathogenesis of persistent pain between men and women, [3,4] but to date sex differences in predictors of persistent post-MVC MSNP have not been assessed.
- We hypothesized that significant differences in predictors of persistent MSNP would exist between men and women experiencing MVC.

METHODS

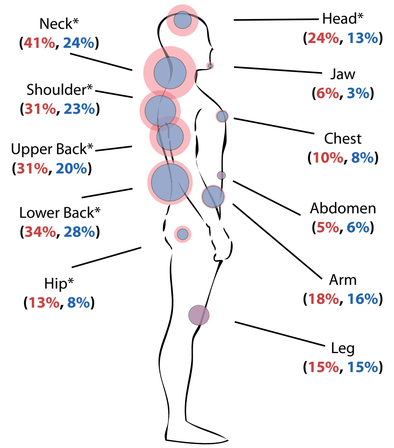
- European American men and women ≥18 and ≤ 65 years of age presenting to one of eight emergency departments (EDs) in four no-fault insurance states within 24 hours of MVC who did not have a serious fracture or other injury requiring hospital admission were enrolled.
- Baseline ED assessment included an evaluation of participant demographic, pre-MVC health, and initial symptom characteristics.
- Six week telephone follow-up assessment included evaluation for the presence of MSNP (defined as neck pain ≥4 on 0 - 10 NRS during the past week). Participants reporting involvement in litigation at six week follow-up were excluded.
- Interactions between gender and other predictors were evaluated and relative risks (RRs) by gender were estimated using Poisson regression adjusted for study site. Interactions with p <.10 were considered significant.

Figure 1. Project CRASH Study Network

Table 1. Characteristics of CRASH study participants

	All n=711	Male n=258	Female n=453
Characteristic	n (%)	n (%)	n (%)
Age			
18-27	261 (37)	91 (36)	170 (38)
28-41	210 (30)	78 (30)	132 (29)
42-65	240 (34)	89 (34)	151 (33)
Education			
High school or less	147 (21)	67 (26)	80 (12)
Some college or trade school	274 (39)	116 (45)	158 (35)
College/post-graduate degree	289 (41)	75 (29)	214 (53)
Annual income			
Below $20,000	90 (14)	23 (10)	67 (16)
$20,000 to $40,000	121 (19)	44 (20)	77 (17)
$40,000 to $80,000	221 (35)	69 (31)	152 (37)
>$80,000	205 (32)	89 (40)	116 (28)
Cigarette Use			
No	534 (75)	190 (74)	344 (76)
Yes	175 (25)	67 (26)	108 (24)
Works full time			
No	305 (43)	90 (35)	215 (47)
Yes	406 (57)	168 (65)	238 (53)
Extent of damage to vehicle			
None-minor	97 (14)	34 (14)	63 (14)
Moderate	205 (30)	73 (29)	132 (30)
Severe	385 (56)	142 (57)	241 (55)
ED Neck Pain			
None/Mild	357 (50)	148 (58)	209 (46)
Moderate	199 (28)	65 (25)	134 (30)
Severe	152 (21)	44 (17)	108 (24)

Figure 2. Percentage of MVC-related Moderate or Severe Pain by Gender at 6 Weeks



* Significant at p <.05
Percentage of MVC-related moderate or severe pain at 6 weeks
(Females, Males)

Table 2. Relative Risk for Moderate or Severe Neck Pain by Gender 6 Weeks post-MVC

	Moderate/Severe Neck Pain		
	RR Females	RR Males	Interaction p-value
Middle vs. low tertile pain catastrophizing	0.99	3.17	0.012
High vs. low tertile pain catastrophizing	1.22	3.47	0.020
Rear ended vs. other collision	1.11	2.28	0.021
Middle vs. young tertile of age	1.06	3.22	0.028
Severe vs. no depression	1.15	2.79	0.053
ED widespread pain presence vs. absence	1.57	2.83	0.069
Old vs. young tertile of age	1.32	3.27	0.072
Severe vs. none/mild overall ED Pain	1.24	3.07	0.076
>7 days estimated physically recover	1.50	2.97	0.088

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RESULTS

- 859/948 (91%) completed 6 week follow-up, 711/948 (75%) were non-litigants and included in analyses.
- MSNP was present in 242/451 (54%) of females vs. 109/257 (42%) of males in the ED ($X^2 = 8.28$, p = .004) and 158/453 (35%) of females vs. 41/258 (16%) of males at 6 week follow-up ($X^2 = 29.40$, p <.001).
- Although women experienced a higher prevalence of persistent pain (Figure 2), individual predictors of pain outcomes were more strongly predictive in men than in women (Table 2).
- Predictors of persistent MSNP that differed significantly in men and women included pain catastrophizing, age, and collision type (Table 2).

CONCLUSIONS

- Significant differences in predictors of MSNP exist between men and women experiencing MVC.
- While women experienced higher rates of MSNP, a number of vulnerability factors were more influential in men.
- Further studies are needed to better understand sex differences in the etiology of post-traumatic pain.

REFERENCES

1. Suissa S, Harder S, Veilleux M. The relation between initial symptoms and signs and the prognosis of whiplash. European Spine Journal 2001;10:44-9.
2. Hartling L, Brison RJ, Ardern C, Pickett W. Prognostic value of the Quebec Classification of Whiplash-Associated Disorders. Spine 2001;26:36-41.
3. Ellis BH, MacDonald HZ, Klunk-Gillis J, Lincoln A, Strunin L, Cabral HJ. Discrimination and mental health among Somali refugee adolescents: the role of acculturation and gender. Am J Orthopsychiatry 2010;80:564-75.
4. Greenspan, Joel D., et al. "Studying sex and gender differences in pain and analgesia: a consensus report." *Pain* 132 (2007): S26-S45.