



# How Tough is the Tough Mudder? Comparing Differences in Injury Incidence Rates at Obstacle Races Versus Marathon Races: A Systematic Review

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## Background

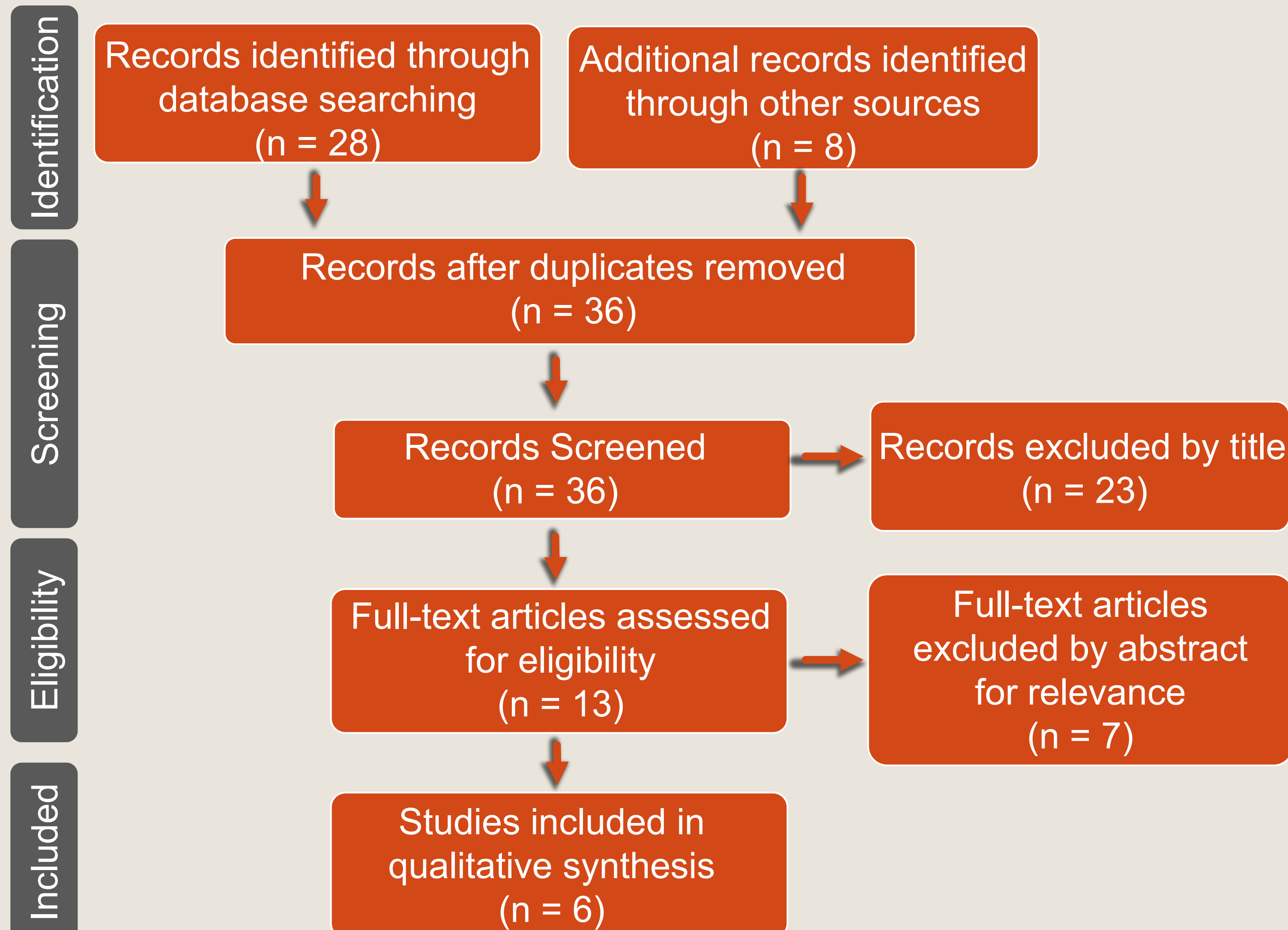
Obstacle course racing is an emerging trend in competitive foot races. Some of these events are named Tough Mudder, Spartan Race and Warrior Dash. From 2010 to 2013 it is estimated that more than 3 million people have competed in these challenge races which is more than twice the number of people finishing traditional marathons during the same period of time. Obstacle course racing requires the ability to run for long distances combined with physical challenges to core strength, agility, balance and coordination. Obstacles include activities such as climbing, swimming, rafting, jumping, swinging and crawling through many different types of terrains and conditions. With the increased challenges comes a theorized increased chance and severity of injury.

## Purpose

To compare the incidence of injuries sustained at obstacle course races to traditional marathon races.

## Methods

A systematic review of recent literature was completed to identify evidence related to the clinical question. The search was completed by utilizing EBSCOhost. A PRISMA strategy utilizing key words identified 36 articles. After applying screening criteria 6 articles were included for data extraction and analysis. Two reviewers assessed quality of evidence using the checklist developed by Downs & Black. A neutral third reviewer was utilized to resolve disagreements leading to a consensus quality rating of good, fair, and poor.



## Summary of Findings

Lead Author and Year	Downs & Black	Type of Race	Rate of Injury	Most Common Reported Injuries	Reported Rate of Hospitalization
C Agar 2009	15 (Fair)	Obstacle (Tough Guy)	1.255% = (251/~20000)	1. Hypothermia 34% 2. Soft tissue 28% 3. MS problems 20% 4. Cramp 17%	14/20000 = 0.070%
Greenberg 2014	12 (Poor)	Obstacle (Tough Mudder)	Not Reported	Not Reported	38/22000 = 0.173%
Lund 2015	15 (Fair)	Obstacle (Warrior Dash and Tough Mudder)	34.04/1000 34.80/1000 37.40/1000 26.53/1000 Totals = 1458/45325 = 3.217%	Not Reported	49/45325 = 0.108%
Pearkes 2016	12 (Poor)	Obstacle (Wolf Run x7 events)	411/43000 = 0.956%	1. MS (acute) 2. Laceration 3. Other 4. MS (chronic) 5. Eye 6. Hypothermia	48/43000 = 0.112%
Roberts 2000	20 (Good)	Marathon (Twin Cities x12 events)	1459/60757 = 2.40%	1. Exercise associated collapse (59.4%) 2. Skin problems (21.6%) 3. MS problems (17.6%)	30/60757 = 0.049%
Tang 2008	19 (Fair)	Marathon (Baltimore x4 events)	1144/33700 = 3.39%	1. Dehydration (32%) 2. MS injuries (25%) 3. Cutaneous wounds (20%)	16/33700 = 0.047%

## Clinical Relevance

In a short amount of time, obstacle course racing has emerged from a novelty to a mainstream athletic competition. Very little is known about the impact that training and competition in such races has on the individual athlete. This report gains some first insight that while the obstacle course athletes may not be injured at a significantly greater rate than marathoners, it appears when injuries do happen they may be more severe as defined by rate of hospitalization.

## Conclusion

Extracted data revealed that reported marathon racer injuries rates were slightly greater when compared to obstacle course racers; however the severity of injuries sustained as defined by need for hospitalization is greater for obstacle course racers. Reporting varied for each type of racing event which makes exact comparisons challenging. As obstacle course races grow in popularity, more research needs to be completed in order to fully appreciate the associated risks of participation.

## References

- Agar C, Pickard L, Bhangu A. The Tough Guy Prehospital Experience: Patterns of Injury at a Major UK Endurance Event. *Emergency Medicine Journal* 2009;26(11):826-830.
- Downs, SH, Black N. The Feasibility of Creating a Checklist for the Assessment of the Methodological Quality Both of Randomized & Non-randomized Studies of Health Care Interventions. *Journal of Epidemiology & Community Health* 1998;52:377-387.
- Greenberg MR, Kim PH, Duprey RT, et al. Unique Obstacle Race Injuries at an Extreme Sports Event: A Case Series. *Annals of Emergency Medicine* 2014;63(3):361-366.
- Keiper M. The Legal Implications of Obstacle Racing and Suggested Risk Management Strategies. *Journal Of Legal Aspects Of Sport* 2014;24:78.
- Lund A, Turris SA, McDonald R, Lewis K. On-Site Management of Medical Encounters During Obstacle Adventure Course Participation. *Current Sports Medicine Reports* 2015;14(3):182-190.
- Pearkes T, Buckley A, Acharya M. Planning and Implementation of Medical Support for a Cross-country Obstacle Race. *Trauma* 2016;18(1):46-53.
- Roberts MO. A 12-yr Profile of Medical Injury and Illness for the Twin Cities Marathon. *Med Sci Sports Ex* 2000;32(9):1549-1555.
- Tang N, Kraus CK, et al. Hospital-based Event Medical Support for the Baltimore Marathon, 2002 - 2005. *Prehospital Emergency Care* 2008;12:320-326.

## Results

	Total injury rate	Hospitalization Rate
<b>Obstacle course</b>	<b>2120/108325 = 1.957%</b>	<b>149/130325 = 0.1143%</b>
<b>Marathon</b>	<b>2603/94457 = 2.756%</b>	<b>46/94457 = 0.0487%</b>

Quality of articles were determined to be 1 good, 3 fair, and 2 poor. 202,782 subjects were included from traditional marathon and obstacle type races. Reported marathon injury incidence rates ranged from 0.024 - 0.034 compared to 0.010 - 0.032 for obstacle style races. The calculated rate of injury from extracted data was 2.8% for marathon participants and 2.0% obstacle course participants. When considering severity of injuries as defined by emergency hospitalizations, the marathon rate was 0.05% and obstacle rate was 0.11%. The most common injuries at marathon races were exertion related, while at obstacle course races the most common injuries were exposure related and musculoskeletal injuries.

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