



# Sleep and Risk of Accidents and Injuries of Adolescents Attending Classes in Two Rotating Shifts

Biserka Radosevic-Vidacek, Adrijana Koscec, Marija Bakotic  
Institute for Medical Research and Occupational Health, Zagreb, Croatia

## INTRODUCTION

Insufficient and irregular sleep, daytime sleepiness and sleep problems can have a negative impact on the control of behaviour, emotions and attention, which can then be associated with different health-risk behaviours and higher risk for accidents and injuries (Dahl and Lewin, 2002; Shochat et al, 2013). Several studies examined relationship between inadequate sleep and risk for accidents and injuries in adolescents whose classes started in the morning. It was generally concluded that insufficient sleep and sleepiness predispose adolescents to accidents and subsequent injuries, especially if they sleep less than 7 hours per school night.

In this study we wanted to examine the relationship between insufficient and irregular sleep and risk for accidents and injuries in adolescents who attended classes in the afternoon every other week, and therefore had more opportunities for sufficient sleep but showed more irregular sleep schedule over a two-week period.

## METHODS

### PARTICIPANTS

N = 2363 adolescents aged 11-18 years

- 1105 from primary school (11-14 years)
- 1258 from secondary school (15-18 years)

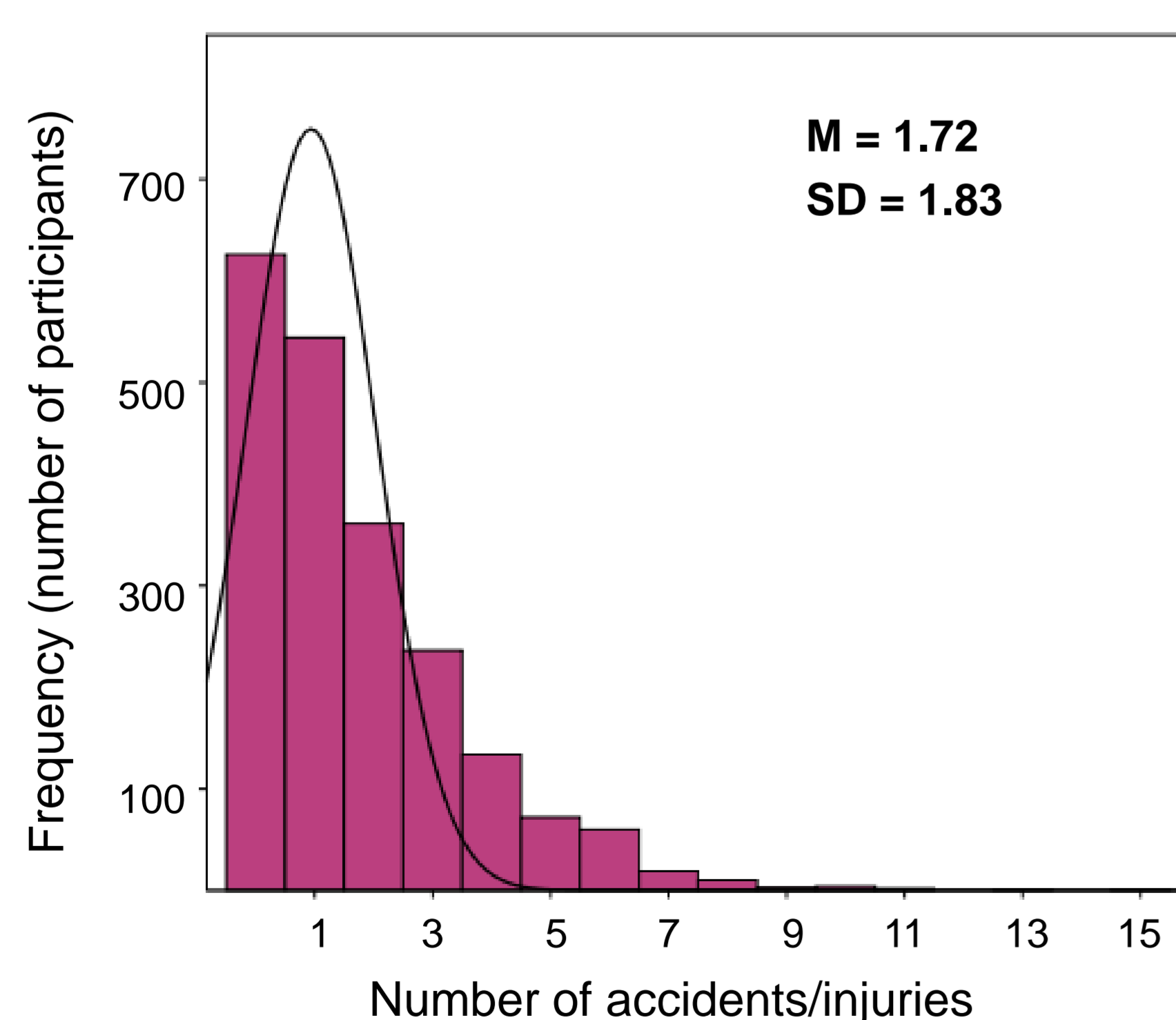
### SCHOOL SHIFT SYSTEM IN CROATIA

- Weekly rotating morning and afternoon shift, weekends off
- Morning shift: 08:00 – 13:00
- Afternoon shift: 14:00 – 19:00

### MEASURES

- Croatian version of School Sleep Habits Survey:
- Sleep characteristics in the last two weeks
  - Daytime sleepiness in the last two weeks (9-item scale; score range 9-36; higher score-higher sleepiness)
  - Number of injuries and accidents in the last 6 months (15-item scale; yes/no responses)

### Distribution of accidents/injuries in the last 6 months in 2073 adolescents



### Examples of accidents and injuries:

- Getting cut
- Falling
- Being burned by fire, chemicals or hot liquids
- Injured while driving a car
- Injured while riding a bicycle, skateboard or rollerblades
- Injured during a team sport, athletic activity or exercise
- Being hit by a moving vehicle while walking

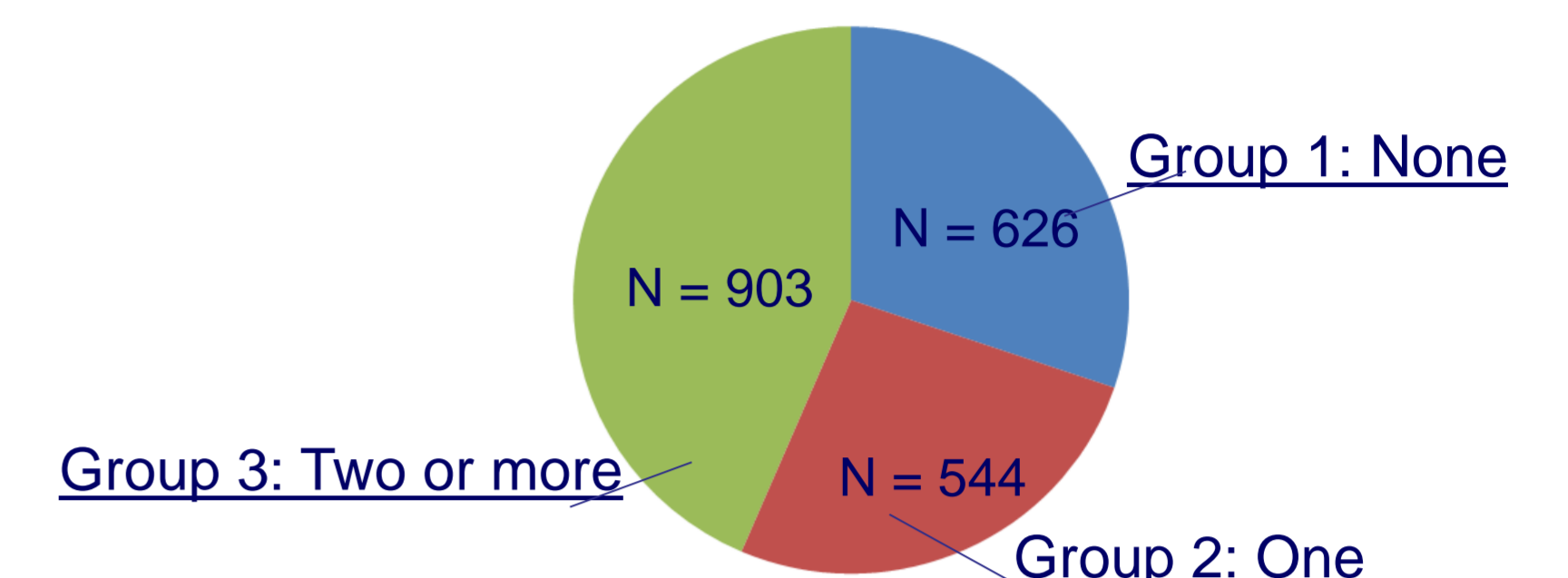
## RESULTS

### ANALYSIS

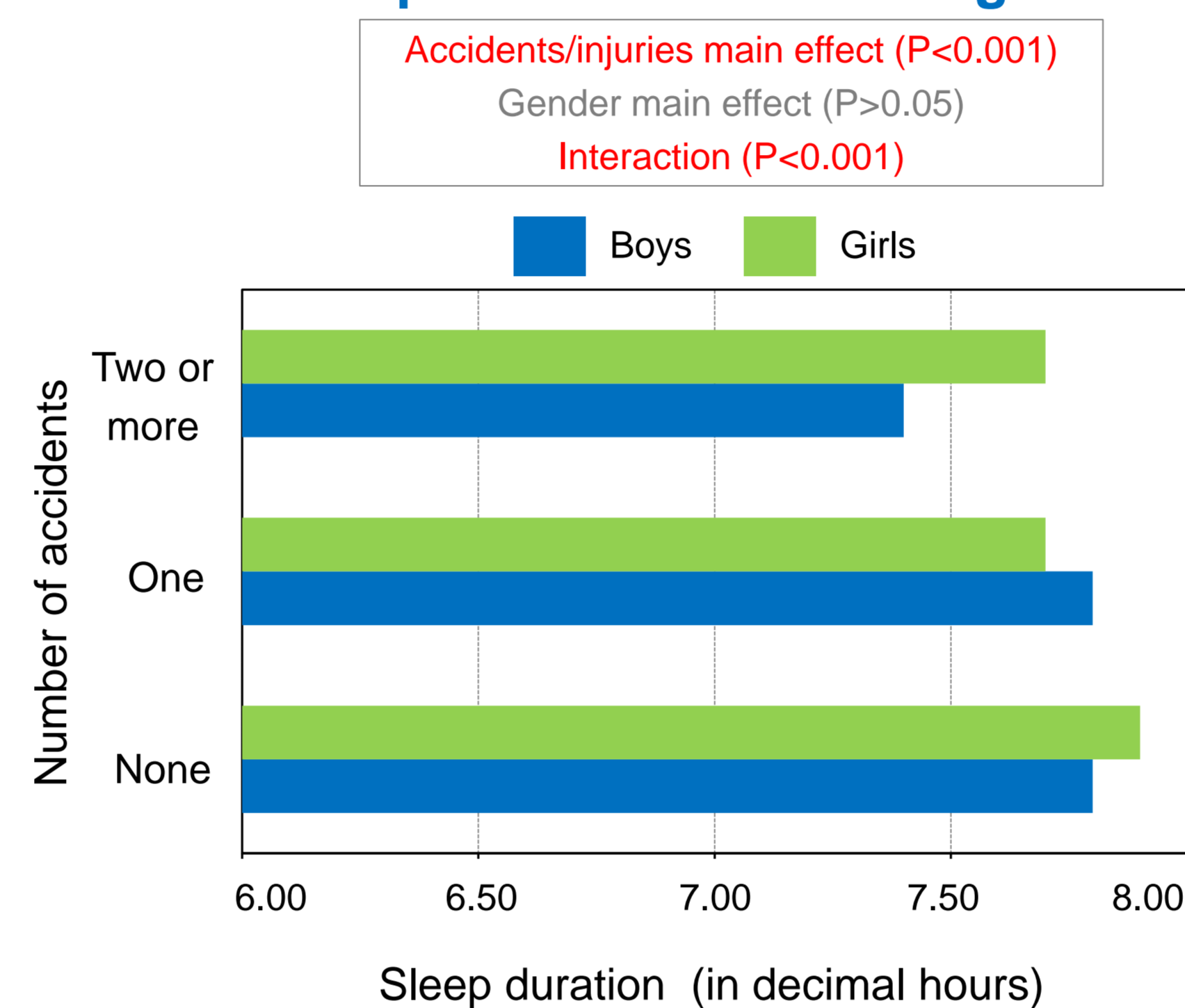
Univariate ANOVAs with two fixed factors: Accidents/injuries (3 groups: none, one, two or more accidents) and Gender was performed for:

- sleep duration on morning shift
- indices of sleep duration irregularities (weekend vs. morning shift; afternoon vs. morning shift)
- indices of bedtime irregularities (weekend vs. morning shift; afternoon vs. morning shift)
- daytime sleepiness.

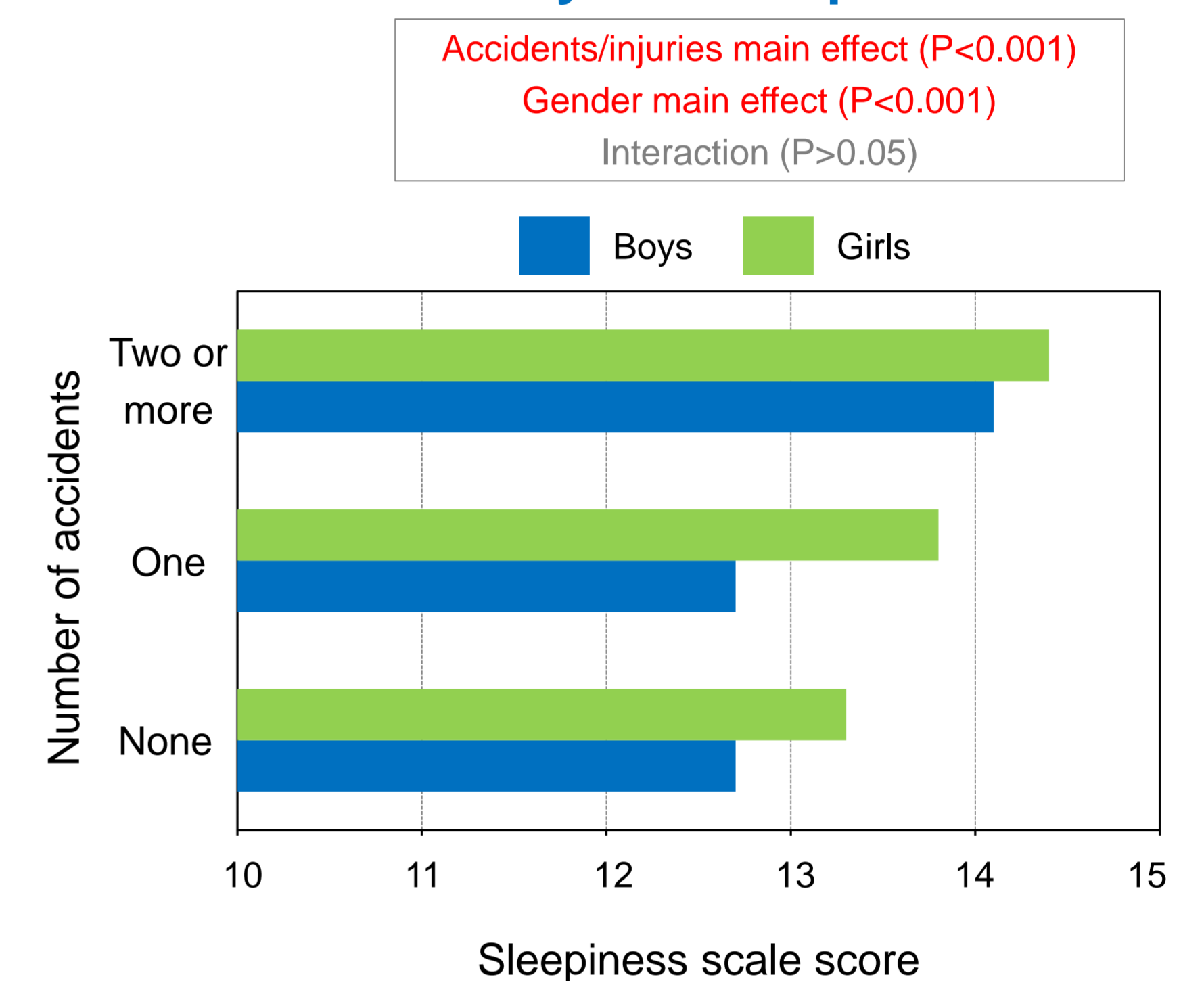
### Groups of subjects by the number of accidents/injuries:



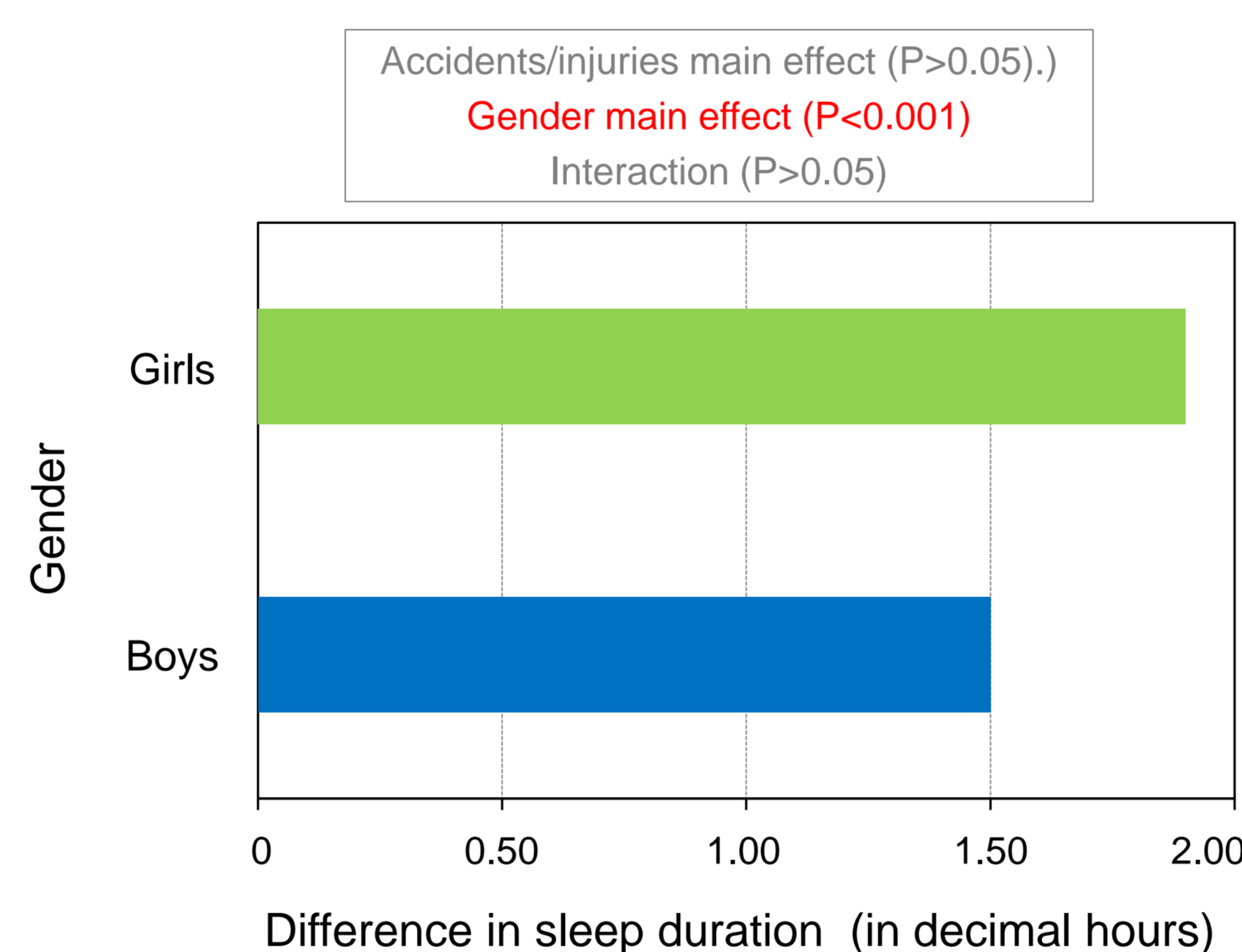
### Sleep duration on morning shift



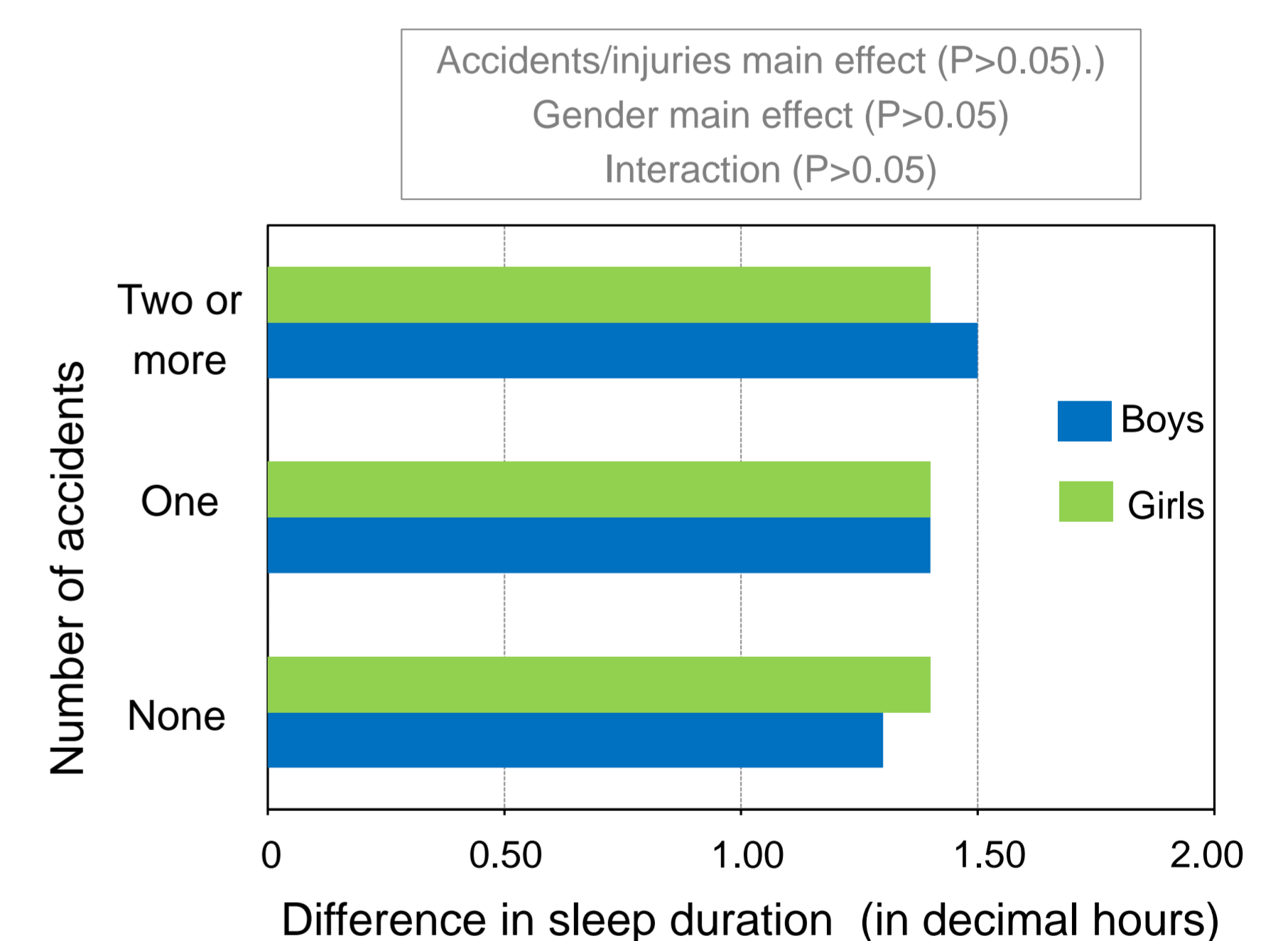
### Daytime sleepiness



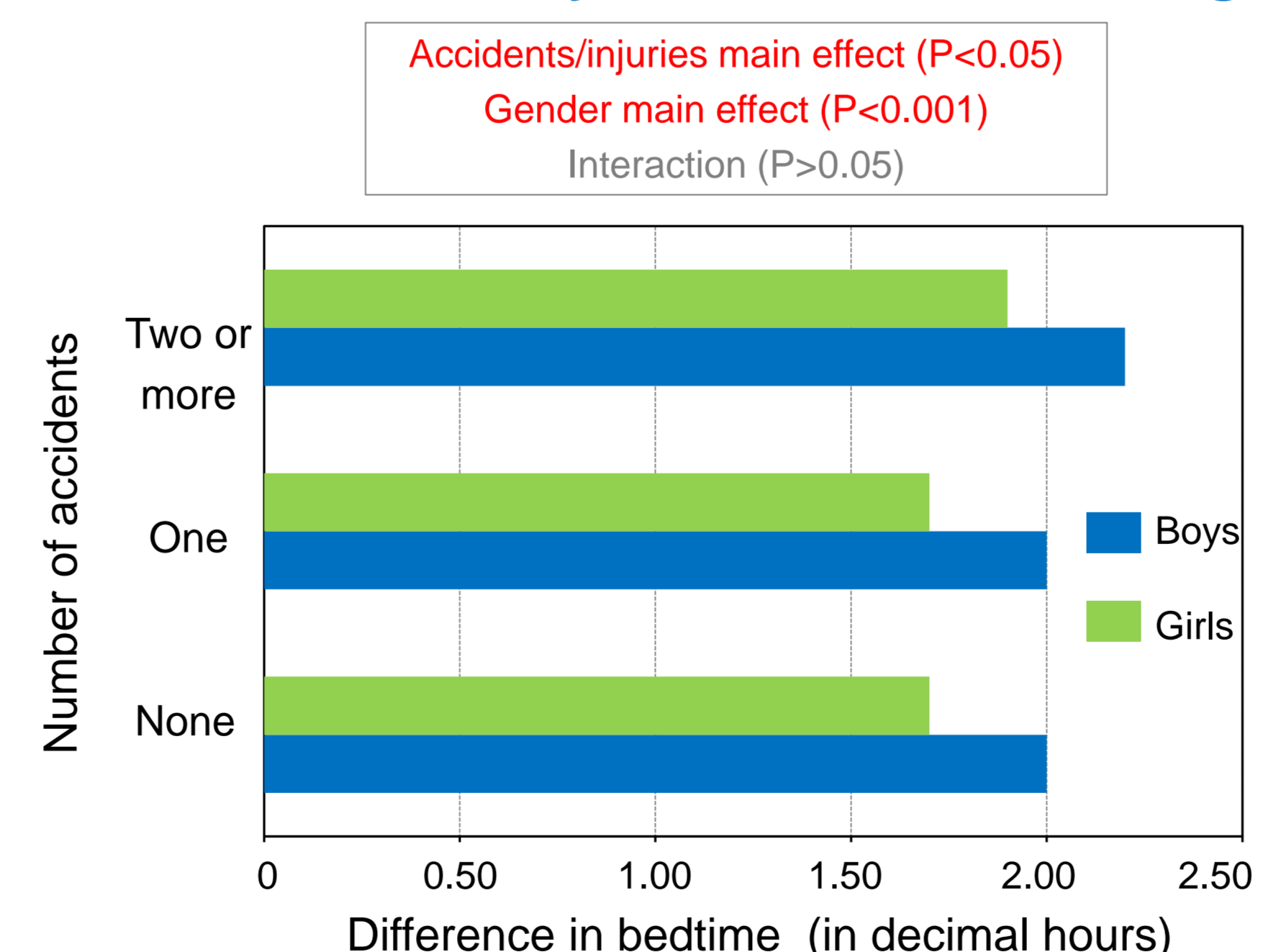
### Longer sleep duration: weekend vs. morning shift



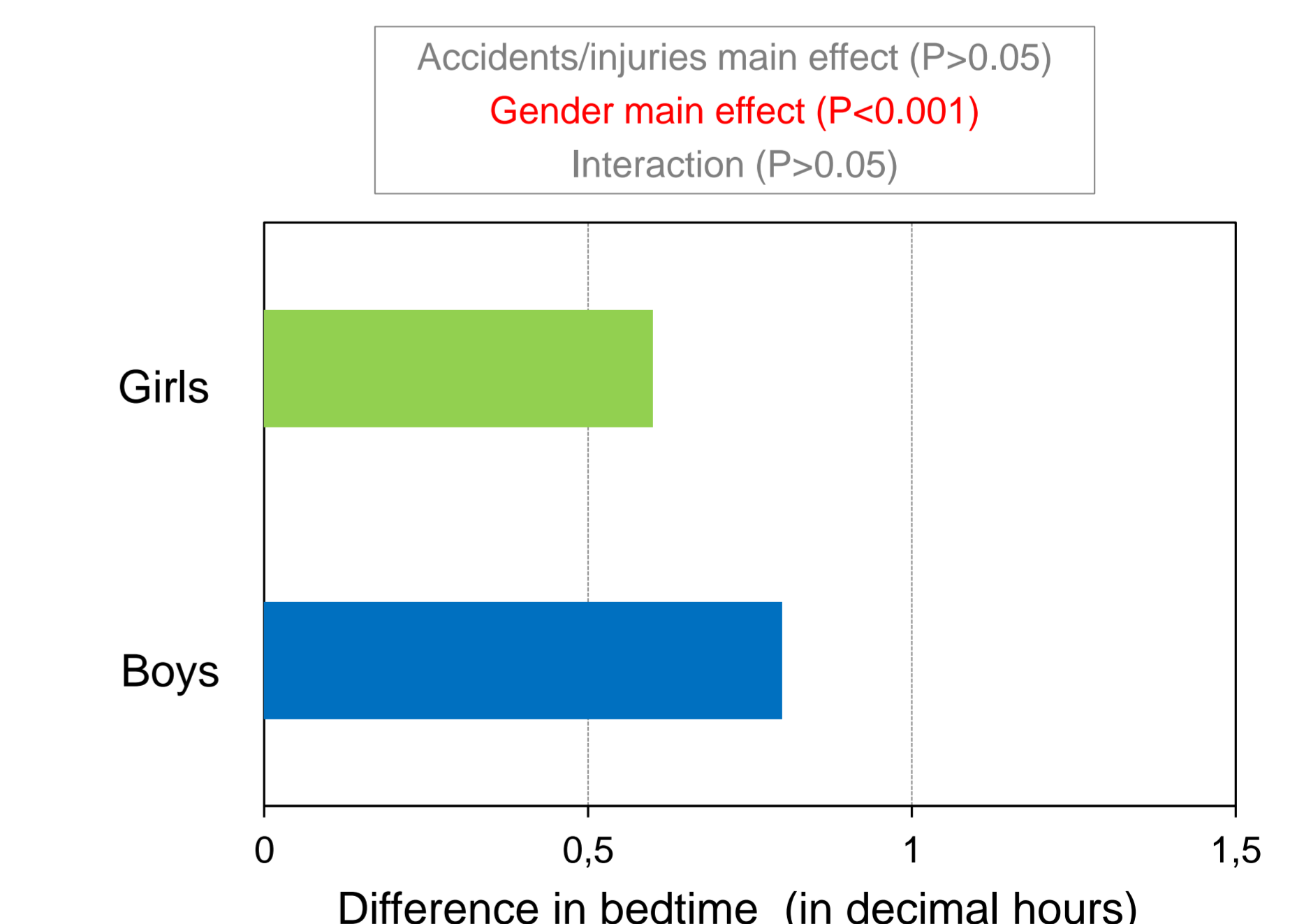
### Longer sleep duration: afternoon vs. morning shift



### Bedtime delay: weekend vs. morning shift



### Bedtime delay: afternoon vs. morning shift



## CONCLUSIONS

The study indicates that insufficient sleep in the week when school starts in the morning is predictive for risk of injuries and accidents even in a school system in which adolescents have opportunity to sleep enough every other week when school starts in the afternoon.

Irregularities of sleep schedule and duration in such school system do not seem to have negative consequences for risk of injuries, with the exception of the bedtime delay on weekend.