

# Autonomic Dysreflexia and Boosting: Lessons from an athlete survey

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# Background

There is no less contentious issue in elite sport than doping to enhance performance.

Athletes are always looking to find the edge over opponents by fair means, or by foul in some cases.

Potentially hazardous risks to health through doping are taken in the pursuit of sporting excellence.

The increasing profile of sport for athletes with a disability and its potential rewards combined with the frailty of human nature, has led some athletes with disabilities to seek improved performance through the administration of prohibited substances.

# Background

There is however, a doping method unique to sport for athletes with a disability, which is termed “boosting”.

Boosting is the intentional induction of autonomic dysreflexia to enhance performance.

The result is a dramatic increase in blood pressure just prior to a competition.

# Physiological Assessment

Some athletes with spinal cord injuries cannot regulate blood pressure and heart rate in the same way as others.

Autonomic dysfunctions are dysfunctions in the parts of the human body not under conscious control.

People with spinal cord injuries experience not only paralysis and loss of sensation, but often have trouble with autonomic functions such as blood pressure, heart rate and bladder and bowel control.

Consequently, during competition a wheelchair athlete's heart rate does not increase according to the body's demands, leading to low blood pressure, fatigue, often poor performance and a loss of endurance.

# Physiological Assessment

The athlete with a high level spinal injury has limited physiological potential for improvements in cardiac output and maximal oxygen uptake which are known to improve racing performance.

The loss of sympathetic cardiac innervation results in a maximum heart rate between 110 to 130 beats per minute determined by intrinsic sino-atrial activity.

The restricted heart rate reserve and reduced stroke volume are further compounded by a loss of catecholamine response to exercise and by the absence of the muscular venous pump in the lower limbs.

# Physiological Assessment

These physiological limitations lead some athletes with high level spinal cord injuries to partly compensate for the loss by the induction of the dysreflexic state.

## **RESULT?**

1. Increased blood pressure
2. Improved blood flow to working muscles
3. Better performance

# How do they do it?

Athletes have learned they can subvert these cardiovascular dysfunctions by causing some pain or discomfort in the area below their injury:

- A. clamping of the urinary catheter to produce bladder distension
- B. excessive tightening of the leg straps
- C. twisting and/or sitting on the scrotum
- D. Some men have been known to break their big toe before the competition
- E. Other less dramatic methods: abdominal binders or pressure stockings on legs that help increase blood pressure



# The Danger?

Potential for a stroke or  
intracranial hemorrhage

Death

# Defining autonomic dysreflexia

- Unique to individuals with lesions above T6
- An uncontrolled rise in systolic and diastolic blood pressure (*250-300mmHg systolic; 100-120 mmHg diastolic*)
- Characterized by headaches, piloerection, sweating (above lesion), stuffy nose, bradycardia
- Triggered by noxious stimuli below lesion (e.g., full bowel & bladder)

# IPC position statement on boosting

A hazardous dysreflectic state is considered to be present when the systolic blood pressure is 180 mmHg or above

Any deliberate attempt to induce autonomic dysreflexia is forbidden, and if observed, will lead to

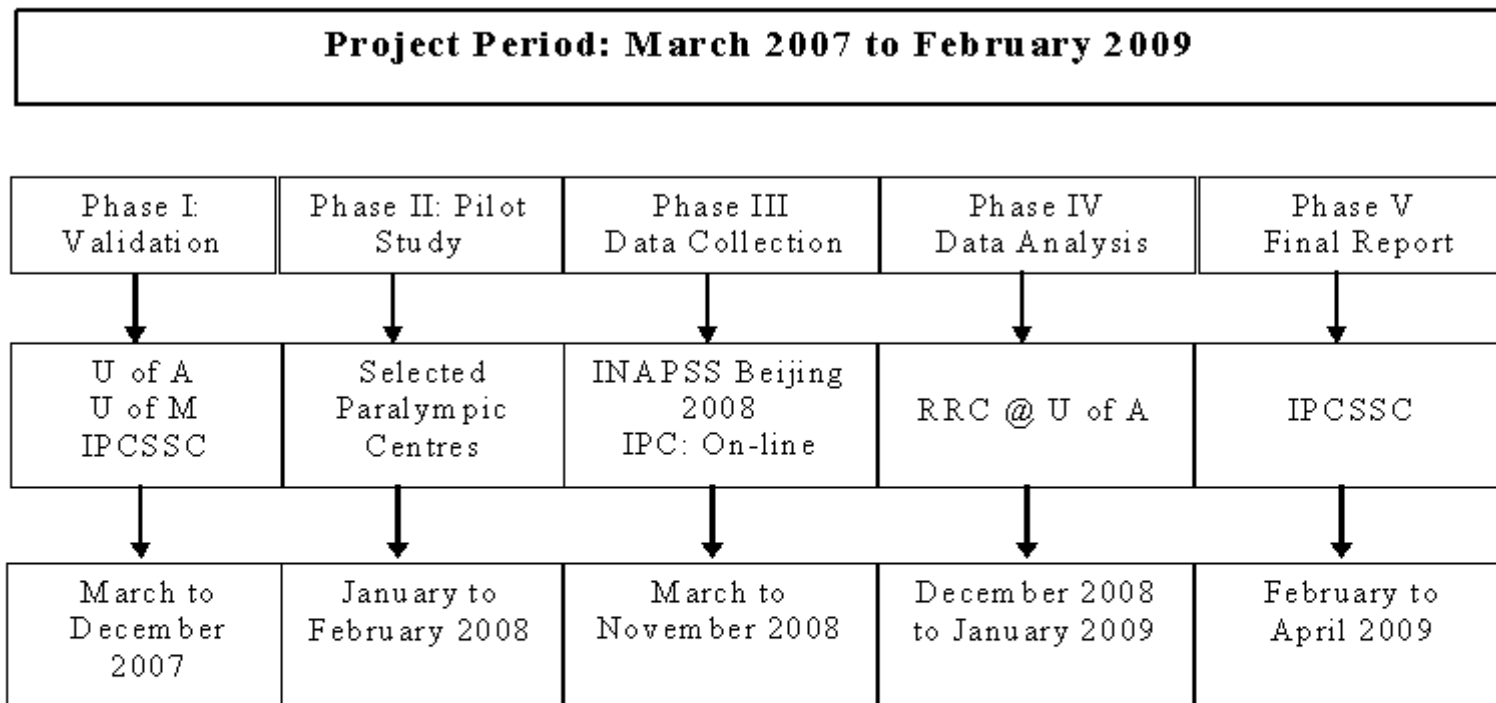
- a) disqualification from the event
- b) subsequent investigation by the IPC  
Ethical Committee

Legal and

# Study Design

- A. Develop and validate a comprehensive boosting questionnaire to provide information about the knowledge, incidence and attitudes of Paralympic athletes regarding boosting, and
- B. More specifically to evaluate these aspects of boosting in male and female Paralympic wheelchair athletes with spinal cord injuries at or above the T6 level.

# Methods



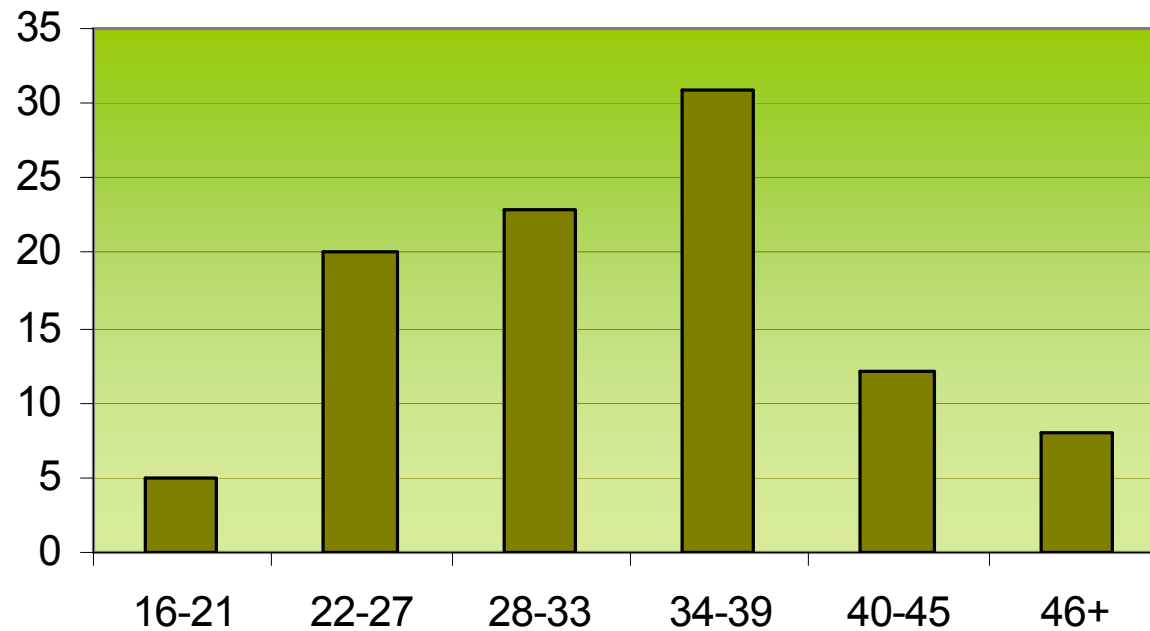
*Legend:* U of A = University of Alberta; U of M = University of Manitoba; IPCSSC = International Paralympic Committee Sport Science Committee; INAPSS = International Network for the Advancement of Paralympic Sport through Science; RRC = Rehabilitation Research Center.

# Subject Characteristics

- 99 participants completed the Boosting Questionnaire
- Three participants did not indicate their gender. Of the remaining 96 participants, 85 (88.4 %) were male and 11 (11.6 %) were female.
- In both genders, the majority of the participants were in the 34 to 39 year (yr) age group (31.3%), followed by the 28 to 33 yr (23.3%), 16 to 21 yr (20.1%) and 40 to 45 yr (12.1%) age groups

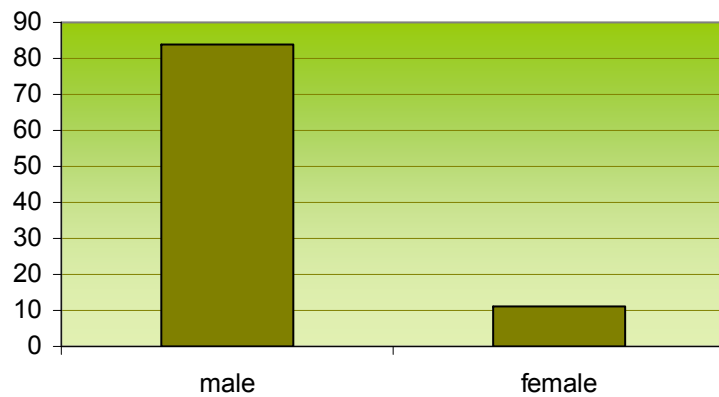
# Subject Characteristics

## Athletes' Age (years)

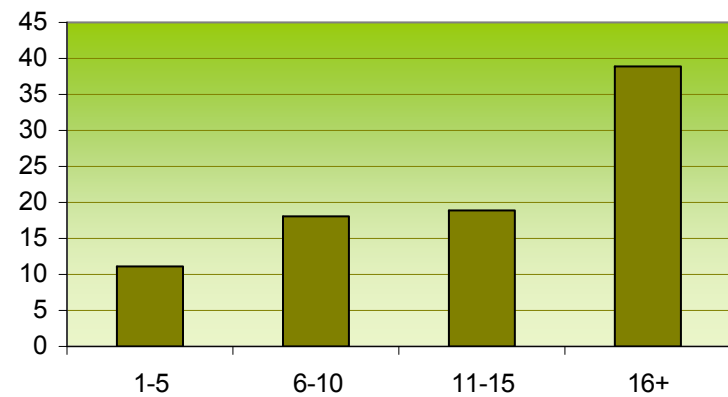


# Participants

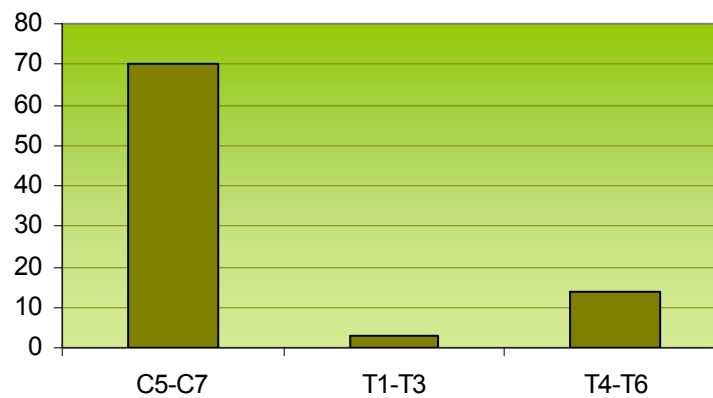
## Gender



## Time since injury (years)



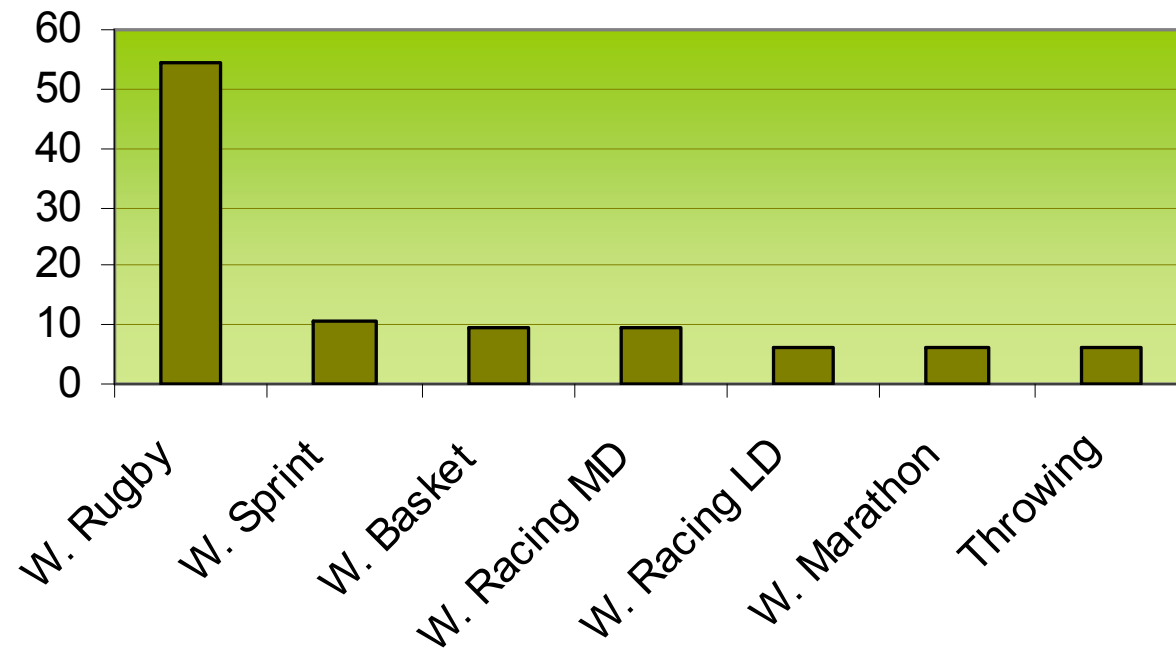
## Lesion level



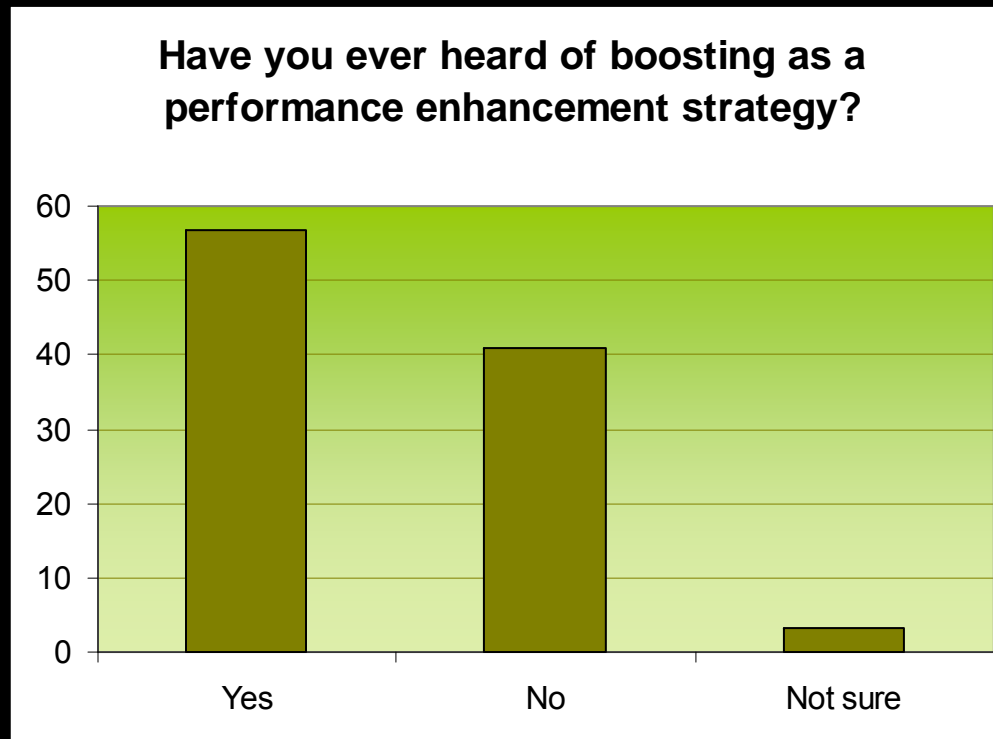


# Participants

## Sports represented (%)



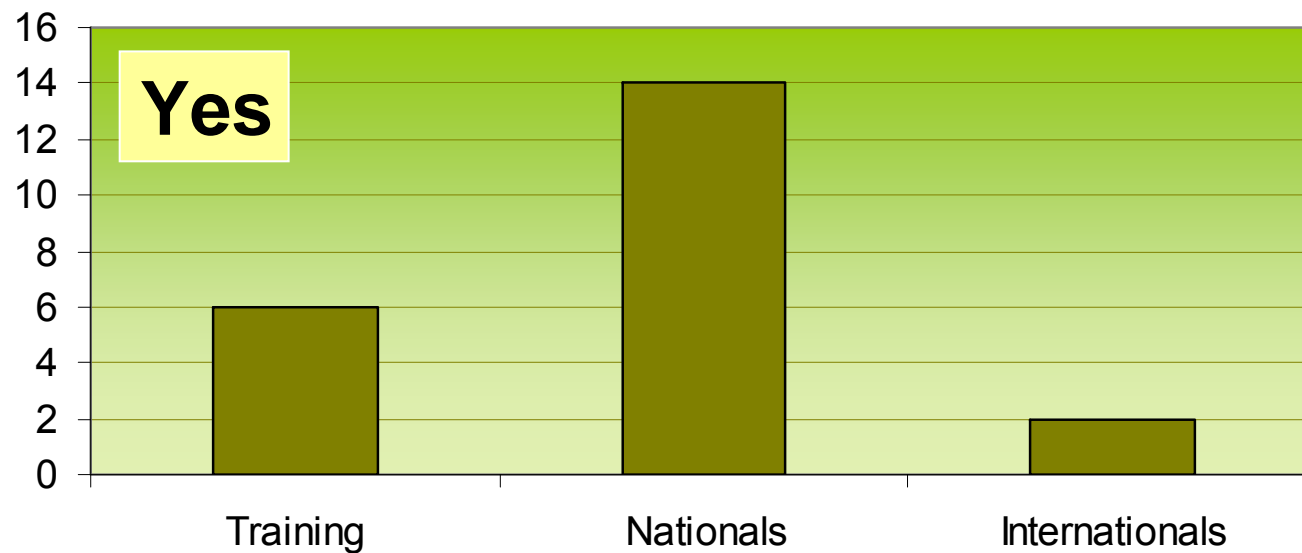
# Results: Awareness and Incidence



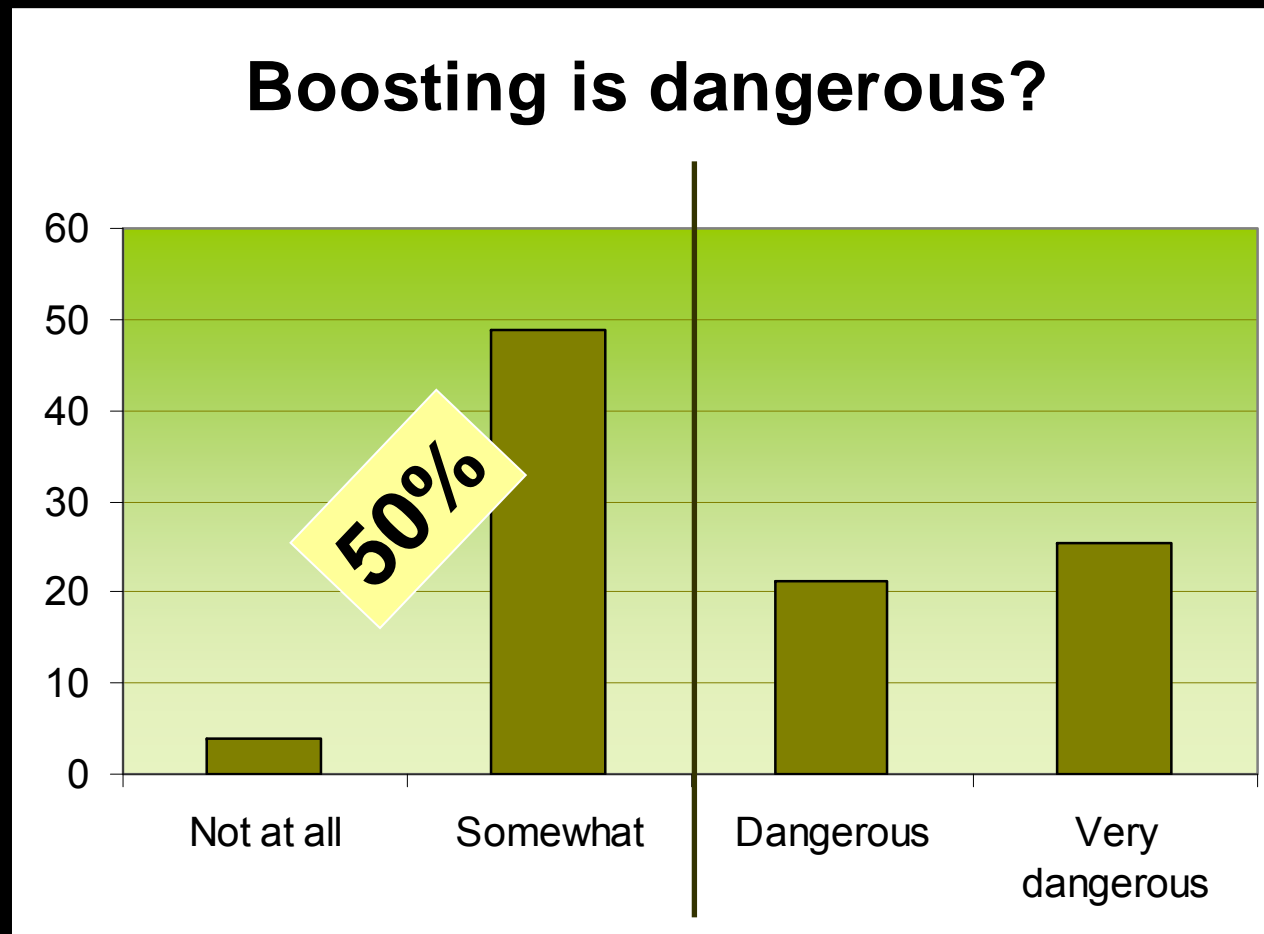
All positive responders are Rugby Players or Long Distance Racers

# Results: Awareness and Incidence

Have you ever intentionally induced AD to boost your performance in training or competition?



# Results: Knowledge and Beliefs



# Conclusions

It should be noted that despite their knowledge pertaining to the dangers and adverse health effects of boosting, **16.7%** of the participants indicated that they had used it to enhance performance during training and/or competition. *This finding should be of concern to the athletes, coaches and trainers, as well as the governing bodies of the Paralympic sport organizations.*

# Final Thoughts

Random monitoring of athletes suspected of boosting was first implemented at the Sydney Paralympic Games in 2000.

During the 2008 Beijing Paralympic Games, a total of 20 athletes, 16 wheelchair racers and four hand cyclists were tested for boosting shortly before competition. None of these athletes demonstrated a positive response on the basis of their blood pressure measurements.

However, it is possible that some athletes could have induced boosting during the competition and circumvented the initial screening process. This is difficult to monitor and poses a real challenge to the procedures for monitoring boosting in these athletes.

## From the athletes:

Anything else you would like to convey to the IPC about doping, boosting, ....

“If boosting isn’t controlled, someone will die”

“If it is possible that all athletes can use boosting, it will be good”

□□□□

Thank you!

Спасибо!

¡Gracias!

Obrigado!

Takker De !

Merci!

□□ □□□□□□!

□□□□

Vielen Dank!

شكرا!

Dank u!

Ringraziarla!

Σας ευχαριστούμε!

Danke!

□□□□□□



## Results – knowledge of boosting

Of the 93 participants who responded to this question, 52 (55.9%) had heard of boosting prior to reading about it in the questionnaire.

Among the remaining 41 participants, 38 (40.9%) had not heard of boosting previously, three (3.1%) participants were unsure and three (3.1%) participants did not respond to the question.

# Results - Incidence of boosting

When the participants were queried whether they were *able to* experience autonomic dysreflexia spontaneously based on their injury level, 43 of the 54 (79.6%) respondents answered positively while 11 (20.4%) answered negatively.

However, when the participants were asked whether they had intentionally induced autonomic dysreflexia, 10 (16.7%) of the 60 respondents responded positively while 50 (83.3%) responded negatively.

Nine of these participants, all males, indicated that they had used boosting during competition and/or training. All these participants had previously experienced autonomic dysreflexia spontaneously.