FOOT-LAUNCHED FLYING INJURIES

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1. MOTIVATION

These sports are often grouped together as if they are the same activity.

• I want to show you that there are important differences in patterns, dynamics and rates of injuries among the sports.

• These differences should be known not only to make medical support and assistance more effective but also to drive research toward safety,
  - the adoption of specific safety rules about flying,
  - the development of appropriate protective clothing and safety systems in each of these sports.
2. METHODS

• This lecture is mainly based on a comprehensive review of medical literature.

• A systematic search of the Pubmed database using the terms “paragliding”, “hang-gliding”, “powered paragliding”, “aerial extreme sports” and “paramotor” has been carried out.

• In addition, the data about speedflying and powered hang-gliding is from the research “Incidents and injuries in foot launched flying extreme sports: a snap shot from the UK”, Francesco Feletti, Andrea Aliverti, Maggie Henjum, et al (a paper with the same title is now under consideration for publication).
3. DEFINITIONS

• The term *foot-launched flying (FLF)* refers to sports in which the pilot is on foot when launching and landing the wing used to fly, without any undercarriage, skids, wheels or floats.

• Foot launched flight associations exist in many countries. The USHPA and the BHPA are the largest with approximately 10,000 and more than 6,500 members respectively.

4. PARAGLIDING

- Paragliding is the most popular among these sports especially in Europe.

- The FFVL (Fédération Française de Vol Libre) included 25,728 members practicing paragliding in 2011.
  

- Paragliders were developed from parachutes and have the same fabric cell structure which is inflated by the wind.
Main reasons for incidents:
- Changes in wind conditions
- Pilot error
  - carelessness
  - lack of experience
- Technical failure

Distribution of incidents during different phases of flight (n=376):
- Take off: 35.1%
- Flight: 16.2%
- Landing: 48.7%

4. PARAGLIDING

Dynamics of Injuries

Glider collapse or deflation

May result in a hard landing or collisions with obstacles:
- trees (78%),
- buildings, vehicles,
- electrical lines (which may cause burn injuries)

Due to their sitting position, paragliding pilots are more prone to lower limb and lower back injuries

• Injuries to the lower limbs are reported in up to 47% of cases.

• In particular fracture or ligament injuries to the ankle mainly caused by a forced pronosupination movement.

• Injuries to the spine and spinal cord in up to 45% of all injuries.

• Since the pilot is in a seated position, the thoracolumbar junction is involved in most cases.

Christey GR, Emerg Med Australas, 2005
Rekand T, Med Sport Sci, 2012
4. PARAGLIDING

Injury Prevention

• Better training
• Improvement of equipment
• Protective measures
  • shock absorbing footwear,
  • spine protector systems.

5. SPEEDFLYING

- Speedflying may be considered a sub-discipline of PG in which a wing about half the size of an average paraglider is used.

- Speedflying is practiced in strong wind and involves high speed and thrilling rides close to the slope.

## 5. SPEEDFLYING: Injuries and Fatalities

### Consequences of incidents in Speedflying compared to other FLF sports

<table>
<thead>
<tr>
<th>Sports</th>
<th>Incidents resulting in injuries (%)</th>
<th>Incidents resulting in fatalities (%)</th>
<th>N. of incidents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Speedflying</td>
<td>85.7</td>
<td>14.3</td>
<td>7</td>
</tr>
<tr>
<td>Paragliding</td>
<td>67.9</td>
<td>2.5</td>
<td>1259</td>
</tr>
<tr>
<td>Hang-gliding</td>
<td>64.8</td>
<td>2.5</td>
<td>324</td>
</tr>
<tr>
<td>Powered hang-gliding</td>
<td>41.7</td>
<td>4.1</td>
<td>24</td>
</tr>
<tr>
<td>Powered paraliding</td>
<td>34.3</td>
<td>4.9</td>
<td>61</td>
</tr>
</tbody>
</table>

- Speedflying had a higher percentage of incidents resulting in injuries and fatalities compared to Paragliding and other FLF disciplines.

In hang-gliding a harness suspends the pilot from a structure made from aluminum, carbon fiber, and high-tech fabrics.

Most injuries are reported during landing. In particular, uncontrolled landings after stalling or on rough ground.

The most severe injuries, however, are reported during takeoff mainly caused by crosswinds, turbulence, gusty winds or pilot error. Johns T, USHPA, 2003.
Since the pilot is suspended from the glider in a prone position the head, upper extremities and trunk are in fixed position and involved in up to 27%, 80% and 34% of cases respectively.

Protective measures:
- helmets,
- protective gloves.
6. “TRADITIONAL” SPORTS

- Paragliding, hang-gliding and speedflying require a slope in order to take off and exploit the rising air from thermals, or lifted air over ridges and mountains.
The motor allows takeoff from flatlands and frees pilots to fly in safer environmental conditions with no need for thermals or wind.

Powered paragliding and powered hang-gliding originated as motorized versions of paragliding and hang-gliding but then they evolved into clearly distinct disciplines.

In both powered paragliding and powered hang-gliding the most commonly reported causes of incidents were pilot error, engine malfunction and glider failure (NOT WEATHER CONDITIONS!)
While in paragliding the most dangerous phase of flight is landing, in powered paragliding most injuries occur during takeoff.

Since the engine allows pilots to recover height rapidly, some paramotor pilots perform aerobatics close to the ground, putting themselves at a higher risk.

Water is particularly dangerous, because the weight of the engine can rapidly drag pilots under the surface, giving them no time to free themselves from the equipment.

7. POWERED PARAGLIDING

Injuries

Anatomic distribution of powered paragliding injuries

- Upper Limbs 44.5%
- Lower Limbs 32%
- Chest 2.7%
- Head 7%
- Pelvis 3.1%

The engine can be a direct cause of incidents

- Contact with the propeller causes the majority of injuries: particularly deep wounds, hand fractures and amputation.

A self-inflating flotation device is an essential piece of safety equipment for pilots wishing to fly a powered paraglider over or near water.

A safety ring is an aluminum ring mounted on the engine cage, specifically designed to make it difficult for the upper limbs to reach the prop.

The distribution of injuries in this sport seems to be similar to hang-gliding; in our study the head was often affected (25%; n=24).

Significantly higher fatal outcomes in powered hang-gliding (4.3%) than in hang-gliding (2.7%) was found.

Specifically designed helmets, foam protectors and air bags should be further developed and could be made compulsory in powered hang-gliding.

9. CONCLUSIONS

Differences in patterns, dynamics and rates of injuries among these sports should be known not only by medical personnel, but also by researchers and equipment manufacturers.

Thank you very much for your attention!

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REFERENCES


6. Feletti F, Aliverti A, Henjum M, Tarabini M, Brymer E. Incidents and injuries in foot launched flying extreme sports: a snap shot from the UK” [Under consideration for publication]


