# SUPPLEMENTARY MATERIAL

Injury prevention in Super – G alpine ski racing through course design

Matthias Gilgien1,2 , Philip Crivelli3, Josef Kröll 4, Live S. Luteberget 1, Erich Müller 4, Jörg Spörri 5,6

1 Department of Physical Performance, Norwegian School of Sport Sciences, Oslo, Norway

2 Center of Alpine Sports Biomechanics, Engadin Health and Innovation Foundation, Samedan, Switzerland

3 WSL—Institute for Snow and Avalanche Research SLF, Group for Snowsports, Davos, Switzerland

4 Department of Sport Science and Kinesiology, University of Salzburg, Hallein-Rif, Austria

5 Sports Medical Research Group, Department of Orthopaedics, Balgrist University Hospital, University of Zurich, Switzerland

6 University Centre for Prevention and Sports Medicine, Balgrist University Hospital, University of Zurich, Switzerland

**\*Correspondence to [Matthias.gilgien@nih.no]**

**Table 4:** Two standard deviations used to express the effects in the mixed model (Table 6).

|  |  |
| --- | --- |
|  | **2SD** |
| **Linear Gate Distance [m]** | 17.07 |
| ***GateOFFSET* [m]** | 14.91 |
| **GateVERTICAL [m]** | 18.18 |
| ***TerrainINCLINE* [°]** | 10.96 |
| ***SpeedIN* [m/s]** | 5.10 |

**Table 5:** The results of the mixed model expressed as a function of 2 standard deviations from Table 6. The table must be read as follows for the example of change in *GateOFFSET* on *∆Speed*. A change of 2 SD in *GateOFFSET* (14.91m from table 5) leads to a reduction in speed (*∆Speed*) of -1.09m/s.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| ***∆Speed* [m/s]** | **Estimate** | **p value** | **Lower Limit** | **Upper limit** |
| **Intercept** | 0.15 | 0.21 | -0.16 | 0.46 |
| ***GateOFFSET* [m]** | -1.09 | <.0001 | -1.48 | -0.70 |
| ***GateVERTICAL* [m]** | 1.44 | <.0001 | 1.05 | 1.84 |
| ***SpeedIN* [m/s]** | -1.16 | <.0001 | -1.57 | -0.75 |
| ***TerrainINCLINE* [°]** | 1.49 | <.0001 | 1.07 | 1.91 |
|  |  |  |  |  |
| **RadiusMIN [m]** | **Estimate** | **p value** | **Lower Limit** | **Upper limit** |
| **Intercept** | 36.80 | 0.00 | 22.18 | 51.42 |
| ***GateOFFSET* [m]** | -14.32 | <.0001 | -17.33 | -11.30 |
| ***GateVERTICAL* [m]** | 4.04 | 0.01 | 0.94 | 7.13 |
| ***SpeedIN* [m/s]** | 8.58 | <.0001 | 5.12 | 12.03 |
| ***TerrainINCLINE* [°]** | -0.13 | 0.94 | -3.48 | 3.22 |
|  |  |  |  |  |
| **GRFMAX [BW]** | **Estimate** | **p value** | **Lower Limit** | **Upper limit** |
| **Intercept** | 2.32 | 0.00 | 1.64 | 3.00 |
| ***GateOFFSET* [m]** | 0.29 | <.0001 | 0.16 | 0.41 |
| ***GateVERTICAL* [m]** | -0.03 | 0.67 | -0.16 | 0.10 |
| ***SpeedIN* [m/s]** | 0.30 | <.0001 | 0.15 | 0.44 |
| ***TerrainINCLINE* [°]** | 0.07 | 0.34 | -0.07 | 0.21 |
|  |  |  |  |  |
| **Impulse [BWs]** | **Estimate** | **p value** | **Lower Limit** | **Upper limit** |
| **Intercept** | 3.24 | <.0001 | 3.12 | 3.36 |
| ***GateOFFSET* [m]** | 1.89 | <.0001 | 1.73 | 2.04 |
| ***GateVERTICAL* [m]** | 0.20 | 0.01 | 0.05 | 0.35 |
| ***SpeedIN* [m/s]** | -0.01 | 0.92 | -0.17 | 0.15 |
| ***TerrainINCLINE* [°]** | 0.03 | 0.68 | -0.13 | 0.20 |

**Table 6:** Results showing the effect of a reduction in speed (*∆Speed*) of -0.5 m/s on *RadiusMIN*, *GRFMAX* and on the predictors *GateOFFSET* and *GateVERTICAL*, *SpeedIN*, *TerrainINCLINE*. This is the same Table as Table 3 in the manuscript, but it includes all predictors from the mixed model. The results must be read as follows for the effect on *RadiusMIN* through a change in *GateOFFSET*: An increase of *GateOFFSET* of 6.84m (Table 7) leads to a speed reduction (*∆Speed*) of -0.5m/s and reduces *RadiusMIN* by -6.57m.

|  |  |  |  |
| --- | --- | --- | --- |
| **RadiusMIN [m]** | **p value** | **Absolute Reduction in RadiusMIN in m as a consequence of speed reduction of 0.5m/s** | **Relative Reduction in RadiusMIN in % as a consequence of speed reduction of 0.5m/s** |
| **Predictor *GateOFFSET* [m]** | <.0001 | -6.57 | -19 |
| **Predictor *GateVERTICAL* [m]** | 0.0100 | -1.40 | -4 |
| **Predictor *SpeedIN* [m/s]** | <.0001 | 3.70 | 11 |
| **Predictor *TerrainINCLINe* [°]** | 0.9400 |  |  |
|  |  |  |  |
|  |  |  |  |
| **GRFMAX [BW]** | **p value** | **Absolute Reduction in GRFMAX in m as a consequence of speed reduction of 0.5m/s** | **Relative Reduction in GRFMAX in % as a consequence of speed reduction of 0.5m/s** |
| **Predictor *GateOFFSET* [m]** | <.0001 | 0.13 | 6 |
| **Predictor *GateVERTICAL* [m]** | 0.6700 |  |  |
| **Predictor *SpeedIN* [m/s]** | <.0001 | 0.13 | 5 |
| **Predictor *TerrainINCLINE* [°]** | 0.3400 |  |  |
|  |  |  |  |
|  |  |  |  |
| **Impulse [BWs]** | **p value** | **Absolute Reduction in Impulse in m as a consequence of speed reduction of 0.5m/s** | **Relative Reduction in Impulse in % as a consequence of speed reduction of 0.5m/s** |
| **Predictor *GateOFFSET* [m]** | <.0001 | 0.87 | 27 |
| **Predictor *GateVERTICAL* [m]** | 0.0100 | -0.07 | -2 |
| **Predictor *SpeedIN* [m/s]** | 0.9200 |  |  |
| **Predictor *TerrainINCLINE* [°]** | 0.6800 |  |  |

\* "Reduction in *RadiusMIN* " refers to the Reduction in RadiusMIN as a consequence of a speed reduction of 0.5m/s

\*\* "Increase in *GRFMAX* " refers to the Increase in GRFMAX as a consequence of a speed reduction of 0.5m/s

\*\*\* "Increase in Impulse " refers to the Increase in Impulse as a consequence of a speed reduction of 0.5m/s

**Table 7:** Comparison of the data for Super – G given also in the manuscript in Table 2 and 3 with the data from the GS study. 18 For GS all turns were pooled into one group with 571 turns and analysed with the same mixed model approach as in this study on Super – G and the GS study. 18 The right-hand section of the table shows the absolute and relative differences between Super–G and GS.

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Super - G** | | |  | **Giant Slalom** | | |  | **Difference between SG and GS (SG - GS)** | |
|  |  |  |  |  |  |  |  |  |  |  |
| *∆Speed* [m/s] | **p value** | **Change required to reduce speed by 0.5 m/s** | **Change required in % to reduce speed by 0.5 m/s** |  | **p value** | **Change required to reduce speed by 0.5 m/s** | **Change required in % to reduce speed by 0.5 m/s** |  | **Change required to reduce speed by 0.5 m/s** | **Change required in % to reduce speed by 0.5 m/s** |
| Predictor *GateOFFSET* [m] | <.0001 | 6.84 | 51 |  | <.0001 | 2.55 | 36 |  | 4.29 | 16 |
| Predictor *GateVERTICAL* [m] | <.0001 | -6.31 | 13 |  | 0.00 | -7.60 | 30 |  | 1.29 | -17 |
| Predictor *SpeedIN* [m/s] | <.0001 | 2.2 | 9 |  | <.0001 | 2.75 | 15 |  | -0.55 | -6 |
| Predictor *TerrainINCLINE* [°] | <.0001 | -3.68 | 19 |  | <.0001 | -6.49 | 32 |  | 2.81 | -13 |
|  |  |  |  |  |  |  |  |  |  |  |
| **RadiusMIN [m]** | **p value** | **Reduction in RadiusMIN in m as a consequence of speed reduction of 0.5m/s** | **Reduction in RadiusMIN in % as a consequence of speed reduction of 0.5m/s** |  | **p value** | **Reduction in RadiusMIN in m as a consequence of speed reduction of 0.5m/s** | **Reduction in RadiusMIN in % as a consequence of speed reduction of 0.5m/s** |  | **Reduction in RadiusMIN in m as a consequence of speed reduction of 0.5m/s** | **Reduction in RadiusMIN in % as a consequence of speed reduction of 0.5m/s** |
| Predictor *GateOFFSET* [m] | <.0001 | -6.57 | 19 |  | <.0001 | -3.39 | 47 |  | -3.18 | -29 |
| Predictor *GateVERTICAL* [m] | 0.01 | -1.4 | 4 |  | 0.42 |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |
| **GRFMAX [BW]** | **p value** | **Reduction in GRFMAX in m as a consequence of speed reduction of 0.5m/s** | **Reduction in GRFMAX in % as a consequence of speed reduction of 0.5m/s** |  | **p value** | **Reduction in GRFMAX in m as a consequence of speed reduction of 0.5m/s** | **Reduction in GRFMAX in % as a consequence of speed reduction of 0.5m/s** |  | **Reduction in GRFMAX in m as a consequence of speed reduction of 0.5m/s** | **Reduction in GRFMAX in % as a consequence of speed reduction of 0.5m/s** |
| Predictor *GateOFFSET* [m] | <.0001 | 0.13 | 6 |  | <.0001 | 0.17 | 2 |  | -0.04 | 4 |
| Predictor *GateVERTICAL* [m] | 0.67 |  |  |  | 0.46 |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |
| **Impulse [BWs]** | **p value** | **Reduction in Impulse in m as a consequence of speed reduction of 0.5m/s** | **Reduction in Impulse in % as a consequence of speed reduction of 0.5m/s** |  | **p value** | **Reduction in Impulse in m as a consequence of speed reduction of 0.5m/s** | **Reduction in Impulse in % as a consequence of speed reduction of 0.5m/s** |  | **Reduction in Impulse in m as a consequence of speed reduction of 0.5m/s** | **Reduction in Impulse in % as a consequence of speed reduction of 0.5m/s** |
| Predictor *GateOFFSET* [m] | <.0001 | 0.87 | 27 |  | <.0001 | 0.42 | 6 |  | 0.45 | 21 |
| Predictor *GateVERTICAL* [m] | 0.01 | -0.07 | 2 |  | 0.88 |  |  |  |  |  |

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