

495 **Appendices**

496 **A Details on the mathematical formulation of the visual objectives**

497 A schematic representation of the objective terms "*looking at the trampoline*" and "*fixation*  
498 *on the trampoline*" is presented in Fig. 5-6.

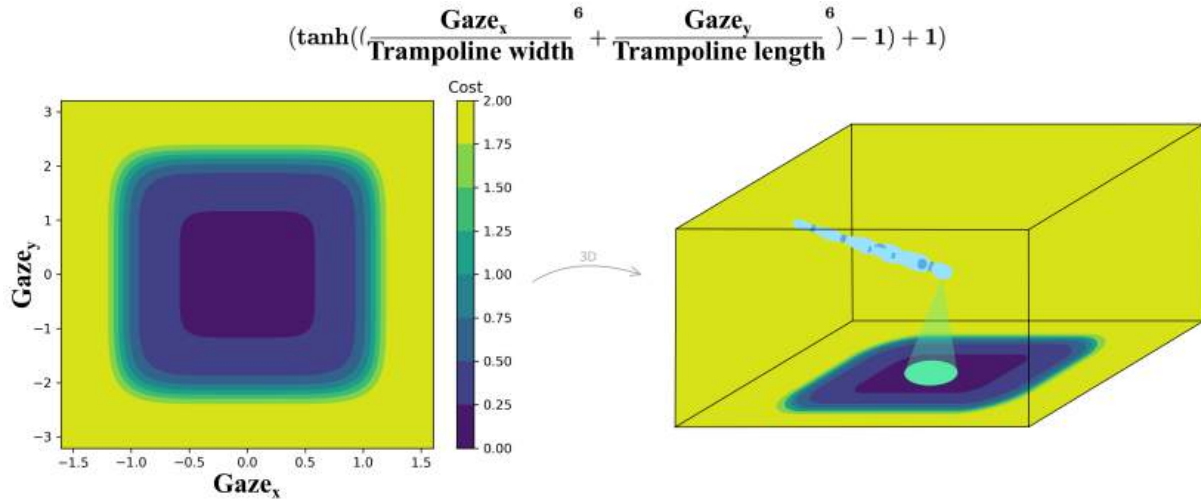


Figure 5. The representation of the objective term "*looking at the trampoline*". When the projection of the gaze falls completely inside the trampoline bed, this objective value is the lowest.

$$\theta = (\arctan(\|\vec{\text{gaze}} \times \vec{\text{fixation}}\| / \vec{\text{gaze}} \cdot \vec{\text{fixation}}))$$

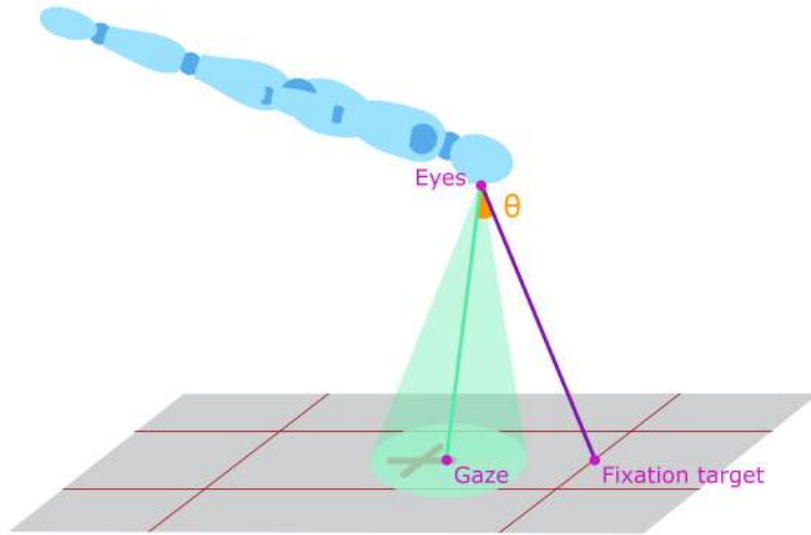


Figure 6. The representation of the objective term "*fixation on the trampoline*". The objective value decreases as the angle between the gaze vector and the desired gaze (*i.e.*, the vector joining the eyes to the fixation target) decreases.

## 499 B Visual criteria evaluation

500 The visual criteria were evaluated along the optimal techniques to show the visual strategy  
 501 modifications induced by the changes in global visual weight (Fig. 7). As the global visual  
 502 weight increased, peripheral vision, spotting, and trampoline fixations were increasingly used  
 503 (lower values in Fig. 7). To increase the use of these strategies, the eye and neck angles had to  
 504 be increased. This prioritization of peripheral vision, spotting, and trampoline fixations over  
 505 eye and neck angles was encouraged by the relative weights of the visual objectives between  
 506 them (Tab. 1).

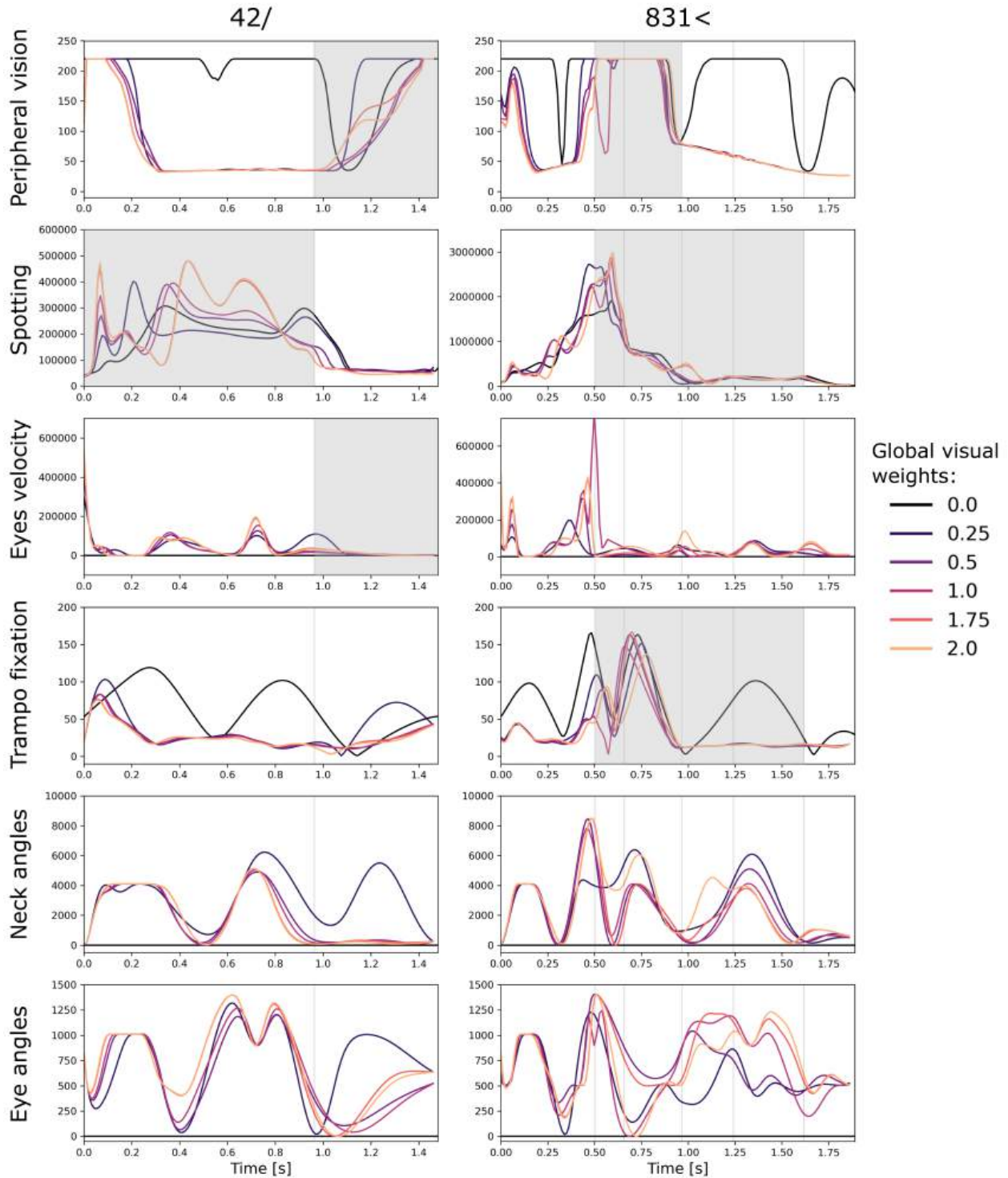


Figure 7. The evaluation of the visual criteria throughout the backward somersault with a twist (left) and the double backward somersault with two twists in pike position (right). A high value indicates that the criterion is not well respected, and a low value indicates that the model currently uses the visual strategy. The shaded regions indicate that this visual criterion was not active for this phase of the OCP. The global visual weighting factors are presented with color lines.

## 507 **C Detailed cost function contributions**

508 The contributions of the different objective terms included in the cost function are pre-  
509 sented in Fig. 8. The largest contributions come from looking at the trampoline, final tilt,  
510 spotting, trampoline fixation, and joint accelerations, depending on the global visual weight  
511 and the acrobatic. There is a clear shift in strategy between the non-vision condition and  
512 when the global visual weight is non-null. For the backward somersault with a twist, raw  
513 objective values increase for the kinematic terms and decrease for the visual terms as the  
514 global visual weight increases. This shows that a compromise between the kinematic and  
515 visual objectives is needed as more efforts were needed to increase vision.

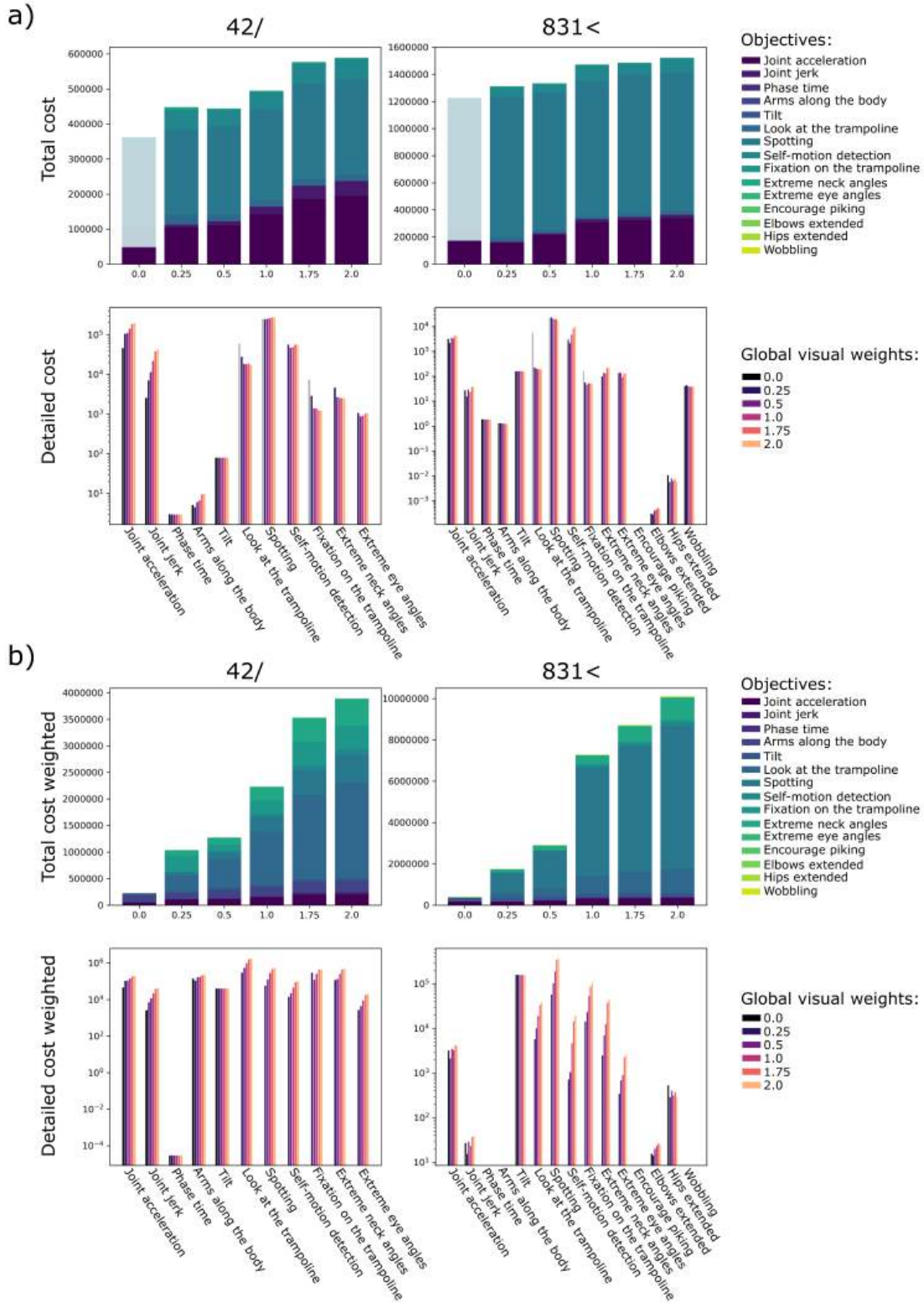


Figure 8. The total cost function value (top rows) with the value of each objectives term (bottom rows) for the optimal techniques with different global visual weights. The raw values (a)) and the values multiplied by their weighting (b)) used in the OCP are presented. The raw detailed objective terms are presented with transparency for comparison when the the global visual weight is nul. The y-axis of the detailed objective terms is on a log scale.

## 516 D Detailed judges deductions

517 In trampolining, judges do not have access to slow motion for execution assessment; thus,  
 518 they instead make a live general assessment of the athletes' acrobatics. Here, in addition  
 519 to this general assessment, we also asked the judges to re-watch the videos and determine  
 520 how much deductions, according to the code of points, should be associated with each of the  
 521 different rules (Fig. 9). Note that, as expected, the initial general deductions are not equal  
 522 to the sum of the detailed deductions.

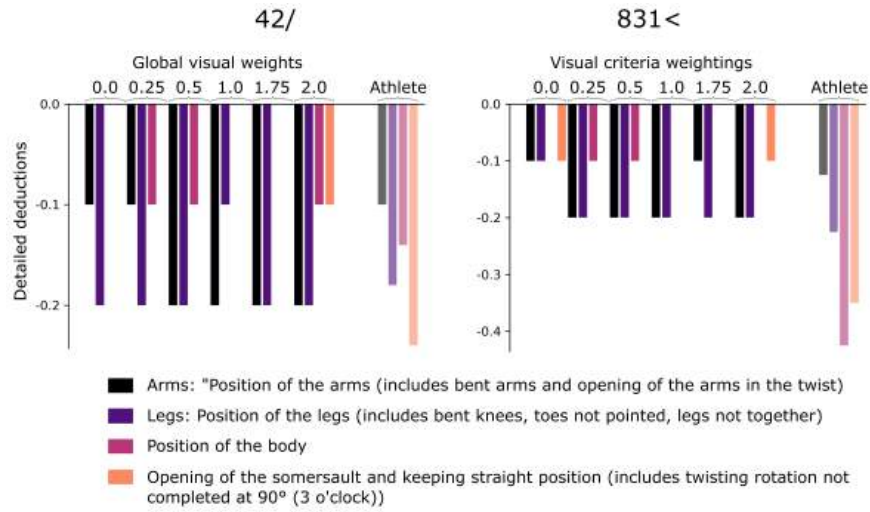


Figure 9. The sum of the two judges' assessment of the specific deductions associated with each of the execution rules for the optimal techniques (color bars) and the mean (shaded color bars) of the sum of the score attributed to the real athletes technique. The results for the backward somersault with a twist (left) and the double backward somersault with two twists in pike position (right) are presented.