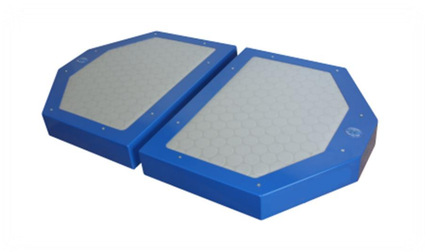
Balance and proportion of leg pressure in Greco-Roman wrestlers standing position

Mariusz Strzecha[1,2], Henryk Knapik[3,4], Paweł Baranowski[5], Jan Pasiak[6],

[1] Katedra Wychowania Fizycznego i Zdrowotnego, Politechnika Radomska, Polska
[2] Wydział Nauk o Zdrowiu, Wyższa Szkoła Nauk Społecznych i Technicznych w Radomiu, Polska
[3] Katedra Metod Specjalnych Fizjoterapii i Sportu Osób Niepełnosprawnych, Akademia Wychowania Fizycznego, Katowice, Polska
[4] Wydział Nauk o Zdrowiu, Radomska Szkoła Wyższa, Polska
[5] Centrum Rehabilitacji im. prof. M. Weissa "STOCER", Konstancin – Jeziorna, Polska
[6] Katedra Badań Operacyjnych i Ekonometrii, Politechnika Radomska, Polska

Introduction

Humans typically transfer weight from one leg onto the other. This is clearly demonstrated by permanent change in the value of pressure to the base surface caused by right and left lower limbs. This movement is commonly known as balancing and can be measured by frequency and amplitude of changes in the value of pressure force during transfer of body weight from one limb to another. The attempts were made in the paper to compare the values of these parameters obtained in relaxed standing position and wrestling standing position.

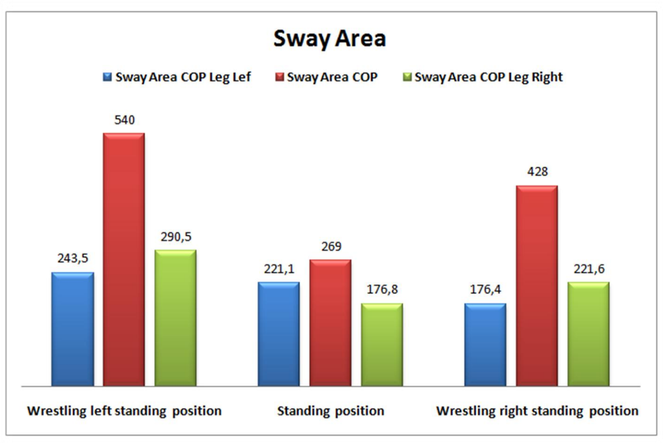


Picture 1. Two platform stabilograph

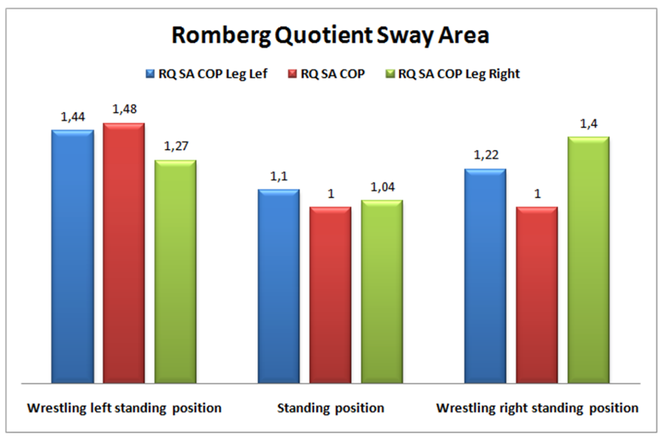
Humans also change the distribution of pressure from both feet on base surface. This can be clearly seen from changes in position of points of application of resultant base reaction forces (center of pressure) coming from lower limbs: right (center of pressure leg right - COPLR) and left (center of pressure leg left - COPLL). This dependence is proved by measurements of the values of pressure forces and the determined points of statokinesiograms. During the investigations, the analysis of the results of changes in these parameters with consideration of dominating wrestling standing position was carried out.

Results & Discussion

The goal of this study was to compare the proportions of load in left and right lower limbs in wrestling standing position, both left and right one. Another goal of the study was to estimate which lower limb during fighting in standing position will show higher stability.
The material comprised 14 competitors from senior National Team. The tests were carried out two weeks prior to the Olympic Games (July 2008) i.e. at the moment of highest form of the competitors.

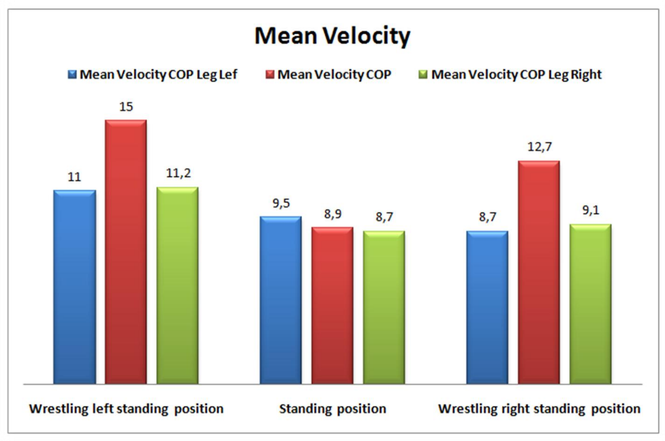


One of the parameters which are most often considered during the evaluation of balance is the value of the surface area (SA) drawn by the moving point of application of the resultant base reaction force, i.e. center of pressure (COP).
During relaxed standing, more stable limb was right leg. However, in both left and right wrestling standing position, left limb turned out to be more stable. More stable position among wrestling competitors was observed for right standing stance (position with right leg in front). The difference in stability amounted to 25%.

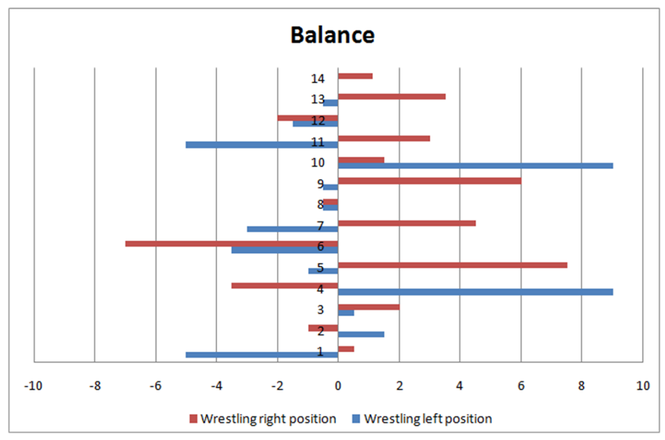


Another parameter often used during evaluation of the balance is Romberg quotient (RQ). RQ denotes the ratio of the value of a given parameter obtained with eyes open (RQ-EO) to the value of the parameter obtained with eyes closed. The higher RQSA quotient, the lower ability to maintain stable position can be observed in the examined person. The biggest effect on postural stability in such persons is from visual feedback.

It is remarkable that the results changed after switching-off the visual feedback (after closing eyes). In relaxed standing position, the results improved both for COP and for left and right leg, while in the case of wrestling standing position (both left and right) the results deteriorated.

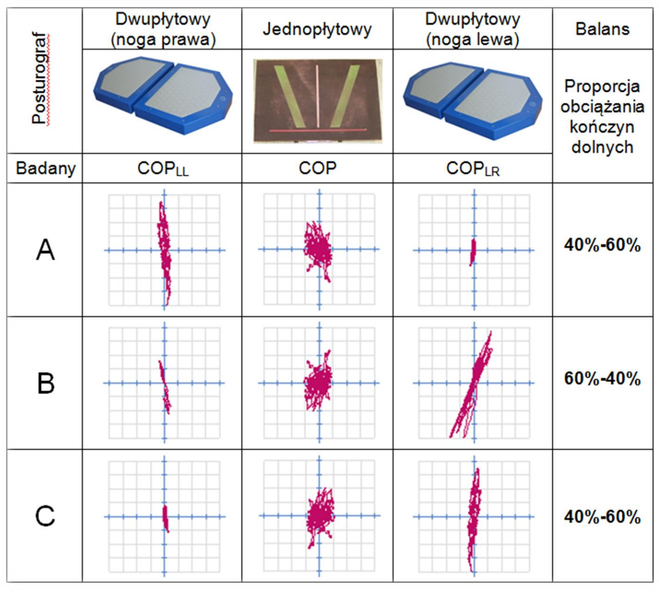


Mean velocity and proportion of load in left and right leg in wrestling standing stance was different, which is presented in Fig.



Conclusions

While analysing the statokinesiograms presented in central column, it is difficult to discern considerable differences in COP images. This result (obtained using single-platform posturograph) mistakenly points to the fact that both investigated persons are characterized by the same ability to maintain balance. Comparison of statokinesiograms of left leg (COPLL) and right leg (COPLR) in the same persons points to considerable differences. It is remarkable that during relaxed standing examination with open eyes, right leg is more stable in the case of A person while in B and C persons more stability can be observed for left leg. If both the investigated were subjected to the effect of forces destabilizing standing position (e.g. push), the probability of losing balance (e.g. fall) by C person would be by 40% higher than in A and B persons. This would happen since A and B put more load to their more stable limb, while C person puts more load to the less stable one, which considerably affects the method of maintaining stable standing position. This also causes that probability of loss of balance (e.g. fall) toward 'weaker' side (which is additionally less loaded) increases. This example proves the essential role of registration of lower limb load proportion, which is only possible through use of two-platform posturograph.



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Separate concurrent measurements carried out for each limb allowed to show considerable differences (in balance parameters) between persons who obtained similar results in single-platform posturographs. Here the question arises: Can both patients, who broke their left or right leg, be diagnosed in the same way and recommended the same set of exercises?
This paper proves incomparability of the results obtained on previously used posturographs (single-platform). The presented results point to the need for stabilographic investigations of transfer of COP using concurrent and independent measurement of transfer of COPLL and COPLR and the registration of changes in balance. The present paper presents new cognitive opportunities connected with implementation of new measurement techniques into stabilography in the form of two-platform stabilographic scales. Human behaviours, fundamentally different for each of the examined persons presented in this study, are not possible to be measured by means of single-platform posturograph.
Such a development in measurement opportunities for stabilography offered by two-platform posturograph might contribute to verification of a number of views existing in this domain.

The authors can be contacted at: e-mail: **strzecha@konto.pl** tel.: **606-592-153**