Straight Jump Landing Position of Trampoline Gymnasts with Stable Occlusal Balance Reflects Standing Postural Control Function

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Abstract: The aim of this study was to clarify the relationship between the landing position during consecutive straight jumps and standing posture stability of trampoline gymnasts with stable occlusal balance. Participants were 10 healthy men (BMI: 18.5–25.0) and 10 trampoline gymnasts (competition experience: ≥12 years), all of whom had stable occlusal balance. To assess postural control function, the displacements in the forward–backward (COP-FB) and the left–right directions (COP-LR) of the center of foot pressure were recorded under eyes-open and eyes-closed conditions. For the trampoline gymnasts, landing positions during 10 consecutive straight jumps were recorded. The horizontal displacements from the center of the bed in the forward–backward (H-FB) and the left–right directions (H-LR) were recorded. Differences in COP displacement between participant groups and between visual conditions were analyzed, along with the correlations between COP displacement and landing position. COP-FB in the eyes-open condition was significantly smaller in trampoline gymnasts than in healthy men (p < 0.05). Significant strong positive correlations were observed between COP-FB and H-FB, and between COP-LR and H-LR (p < 0.05). The postural control function of trampoline gymnasts was superior to that of healthy men in the eyes-open condition. The landing position during straight jumps of trampoline gymnasts with stable occlusal balance reflects standing postural control function.

Keywords: occlusal balance; postural control function; center of foot pressure; landing position; straight jump; trampoline

1. Introduction

Postural control involves visual, vestibular, and somatosensory receptors. These receptors send information about changes in posture to the central nervous system and output signals to postural muscles to maintain postural stability [1–3]. In sensory integration, there are individual differences in the importance given to each sensory input [3]. It has been reported that athletes prioritize different sensory inputs according to the characteristics of the event they are participating in, including the level of competition [4–8], and it is expected that such information will one day be applied to training and rehabilitation. Postural control function is assessed using a variety of static and dynamic measures, including accelerometers, electromyograms, nystagmus, centroids, and reaction times [9]. Gravity center fluctuation meters are widely used in the research field to analyze postural control in the static maintenance of a standing position [10]. It has been established that the center of foot pressure (COP), which is the fulcrum of the force applied to the body,
moves synchronously with the body’s center of mass (COM). In addition, the usefulness and validity of using COP as an index of COM has been reported [11].

A trampoline competition is an event in which 10 jumps involving different techniques are continuously performed for a total flight time of about 20 s [12]. During flight, it is necessary to instantly recognize position with respect to the center of the bed, create an aerial posture, and control one’s body movements. Therefore, sports vision, spatial awareness, and the ability to control minute shifts in posture are essential traits for gymnasts in trampoline competitions. The straight jump, which is the most basic exercise in trampoline competitions, uses the strong repulsive force of the bed transmitted from the soles of the feet to maintain a standing posture while in mid-air [13]. This exercise is presumed to be a technique that directly reflects the postural control function.

A previous study examined the relationship of the occlusal contact state, which affects oral somatosensory input, with static postural control function, targeting trampoline gymnasts whose performance is influenced by fine balance and postural control [14]. It was clarified that equalization of the occlusal contact state by wearing a mouthguard contributed to the improvement of static postural control function in trampoline gymnasts. Furthermore, COP displacement was shown to decrease in all groups of untrained adults, weightlifters, and gymnasts when wearing mouthguards adjusted to equalize occlusal contact. Characteristically, gymnasts, the group with the best postural control without a mouthguard, showed the greatest reduction in COP displacement when wearing a mouthguard [15].

The purpose of this study was to clarify the relationship between standing postural stability and performance in trampoline gymnasts. To this end, differences in COP between trampoline gymnasts and healthy men as well as the relationship between the landing position during consecutive straight jumps and the COP displacement were investigated. The null hypothesis was that there were no differences in COP between participant groups or between visual conditions, and that there was no correlation between landing position and the displacement of COP.

2. Materials and Methods

This study was approved by the Ethics Committee of the Nippon Dental University School of Life Dentistry at Niigata (ECNG-R-375). The details of the study were described in full to all participants, and written informed consent was obtained from all participants prior to their participation.

This study was conducted according to the PRILE 2021 guidelines (Figure 1) [16].

2.1. Participants

Participants were 10 healthy men with a BMI of 18.5 to 25.0 (mean age: 19.5 ± 1.1 years) and 10 male trampoline gymnasts with at least 12 years of competition experience (mean age: 19.4 ± 1.5 years), all of whom had less than 10% difference in occlusal contact area between the left and right sides. Training sessions for the trampoline gymnasts were 6 days a week (3 h/day).

2.2. Measurement of the Occlusal State

The occlusal state was measured using a pressure-sensitive film (Dental Prescale, 50H-R type; Fujifilm Co., Ltd., Tokyo, Japan), and evaluated using its associated analysis apparatus (Occluzer FPD-709; Fujifilm Co., Ltd.) [17,18]. Measurements were performed by two dentists familiar with occlusal recording and measurement equipment. A Dental Prescale was inserted into the mouth of each participant, after which they clenched with maximum force for 3 sec in the intercuspal position. The Dental Prescale was then removed and occlusal balance, occlusal contact area, and occlusal force were analyzed using the Occluzer. In this study, participants with a difference in occlusal contact area relative to the total occlusal contact area of less than 10% between the left and right sides were included for analysis (Figure 2).
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2.3. Measurement of Standing Postural Control Function
A gravity center fluctuation meter (GRAVICORDER GS-7; Anima, Tokyo, Japan) was used to measure standing postural control function. The measurement was performed according to the manufacturer’s recommended protocol, and the displacement of the COP in the forward–backward direction (COP-FB) and the left–right direction (COP-LR) was recorded \[3,14,15,19,20\]. Measurements were performed and instructions were delivered to the participants by a dentist skilled in operating the gravity center fluctuation meter. To prevent body displacement due to visual and auditory stimuli, participants were asked to stand upright in a quiet, evenly lit environment in a closed position with the feet together so that the center of the sole coincided with the reference point on the measurement table. Participants were instructed to gaze at a target 2 m in front of them at eye level. Next, participants were instructed to maintain a light clenching. Recording was performed for 30 s with eyes open. After that, the eyes were closed and the recording was performed for 30 s (Figure 3). Each measurement was performed three times.
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Figure 2. Results of occlusal contact state analysis. (A) Example of a result that satisfied the inclusion criteria, (B) example of a result that did not satisfy the inclusion criteria.

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Figure 3. Measurement of standing postural control function using a gravity center fluctuation meter (GRAVICORDER GS-7). (A) Example center of gravity locus diagram with eyes open; (B) example center of gravity locus diagram with eyes closed. a: displacement of the center of gravity in the left–right direction; b: displacement of the center of gravity in the forward–backward direction, c: unit locus length, d: unit area locus length, e: area enclosed by the trajectory of the center of gravity movement.

2.4. Measurement of Landing Position in Straight Jump

Landing positions for 10 consecutive straight jumps were recorded for the trampoline gymnasts. An all-in-one measurement system (HDTS EU-7100; Eurotramp, Weilheim an der Teck, Germany) was used to measure the landing position on the bed. Measurements were performed and instructions were delivered to the gymnasts by one of their athletic trainers. Calibration was performed and then recording started. For each jump, the horizontal displacement from the center of the bed in the forward–backward direction (H-FB) and in the left–right direction (H-LR) was recorded (Figure 4). One trial consisted of 10 consecutive straight jumps following a preliminary jump from a stationary state. The number of preliminary jumps was optional for the gymnast. Trials were performed three times, and the average value was used for analysis.
2.4. Measurement of Landing Position in Straight Jump

Landing positions for 10 consecutive straight jumps were recorded for the trampoline gymnasts. An all-in-one measurement system (HDT5 EU-7100; Eurotramp, Weilheim an der Teck, Germany) was used to measure the landing position on the bed. Measurements were performed and instructions were delivered to the gymnasts by one of their athletic trainers. Calibration was performed and then recording started. For each jump, the horizontal displacement from the center of the bed in the forward–backward direction (H-FB) and in the left–right direction (H-LR) was recorded (Figure 4). One trial consisted of 10 consecutive straight jumps following a preliminary jump from a stationary state. The number of preliminary jumps was optional for the gymnast. Trials were performed three times, and the average value was used for analysis.

Figure 4. Measurement of landing position using an all-in-one measurement system (HDT5 EU-7100). X [cm]: displacement from the center of the bed in the forward–backward direction; Y [cm]: displacement from the center of the bed in the left–right direction.

2.5. Statistical Analysis

Statistical analysis was performed using IBM SPSS 24.0 (SPSS Japan Inc., Tokyo, Japan). For all measured values, the Shapiro–Wilk test was used for the normality test, and Levene’s test was used for the homoscedasticity test. Significance was set at $p < 0.05$.

First, the differences in COP displacement between participant groups and between visual conditions were analyzed. For COP-FB and COP-LR, displacements to the front and right were recorded as positive values, while displacements to the rear and left were recorded as negative values. Accordingly, the absolute value was used for the analysis as the amount of displacement from the COP. Statistical analysis was performed using a split-plot design for differences in COP-FB displacement or COP-LR displacement between participant groups and visual conditions.
participant groups and between visual conditions, as normality and homoscedasticity were observed at each level of each factor.

Next, the correlation between COP displacement and landing position in straight jumps was analyzed in the trampoline gymnasts. Landing positions were recorded as positive values for forward and right landings and as negative values for rearward and leftward landings relative to the center of the bed. The recorded values were used for correlation analysis between COP-FB and H-FB, and between COP-LR and H-LR. The analysis was performed using Pearson’s product-moment correlation coefficient.

3. Results

Table 1 and Figure 5 show the results of a split-plot design for the differences in COP-FB according to participant groups and visual conditions. Only the participant factor was significant, and the visual factor and interaction were not significant. Therefore, differences in COP-FB between participant groups were analyzed using Student’s t-test. The difference between participant groups was observed in the eyes-open condition and was significantly smaller in the trampoline gymnasts than in the healthy men ($p < 0.05$). There was no significant difference between the participant groups in the eyes-closed condition.

Table 2 and Figure 6 show the results of a split-plot design for the difference in COP-LR according to participant group and visual condition.

<table>
<thead>
<tr>
<th>Source</th>
<th>df</th>
<th>SS</th>
<th>MS</th>
<th>F Value</th>
<th>p-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Participant group (A)</td>
<td>1.802</td>
<td>1</td>
<td>1.802</td>
<td>2.503</td>
<td>0.046 *</td>
</tr>
<tr>
<td>Visual condition (B)</td>
<td>0.001</td>
<td>1</td>
<td>0.001</td>
<td>0.001</td>
<td>0.978</td>
</tr>
<tr>
<td>A × B</td>
<td>0.603</td>
<td>1</td>
<td>0.603</td>
<td>0.837</td>
<td>0.366</td>
</tr>
<tr>
<td>Error</td>
<td>25.923</td>
<td>36</td>
<td>0.720</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>140.855</td>
<td>40</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

df: degree of freedom. SS: sum of squares. MS: mean square. * $p < 0.05$: denotes statistically significant difference.

![Figure 5](image_url)

**Figure 5.** Comparison of forward–backward displacement of the center of foot pressure (COP-FB) under eyes-open and eyes-closed conditions. Measurements are expressed as means ± SD. Error bar indicates standard error of the mean. Differences between participant groups were observed in COP-FB in the eyes-open condition and were significantly smaller in the trampoline gymnasts than in the healthy men ($p < 0.05$). No significant differences were observed between visual conditions in either participant group.

Table 2 and Figure 6 show the results of a split-plot design for the difference in COP-LR according to participant groups and visual conditions. Neither the participant factor, visual factor, nor interaction were significant. The COP-LR tended to be lower in the trampoline gymnasts than in the healthy men under both eyes-open and eyes-closed conditions, but no significant differences were observed.
Table 2. Results of a split-plot design for the difference in COP-LR according to participant group and visual condition.

<table>
<thead>
<tr>
<th>Source</th>
<th>df</th>
<th>SS</th>
<th>MS</th>
<th>F Value</th>
<th>p-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Participant group (A)</td>
<td>0.261</td>
<td>1</td>
<td>0.261</td>
<td>3.861</td>
<td>0.057</td>
</tr>
<tr>
<td>Visual condition (B)</td>
<td>0.107</td>
<td>1</td>
<td>0.107</td>
<td>1.586</td>
<td>0.216</td>
</tr>
<tr>
<td>A × B</td>
<td>0.002</td>
<td>1</td>
<td>0.002</td>
<td>0.023</td>
<td>0.880</td>
</tr>
<tr>
<td>Error</td>
<td>2.432</td>
<td>36</td>
<td>0.068</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>16.246</td>
<td>40</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

df: degree of freedom. SS: sum of squares. MS: mean square.

Figure 6. Comparison of left–right displacement of the center of foot pressure (COP-LR) under eyes-opened and eyes-closed conditions. Measurements are expressed as means ± SD. Error bar indicates standard error of the mean. There were no significant differences in COP-LR between healthy men and trampoline gymnasts in the eyes-open and eyes-closed conditions. In addition, no significant differences were observed between visual conditions in either participant group.

Figure 7 shows the results of the correlation analysis between COP-FB and H-FB. A strong positive correlation was observed between COP-FB and H-FB (R = 0.750, p < 0.05). There was a tendency for the amount and direction of displacement in the forward and backward direction of COP to coincide with the landing position.

Figure 7. Correlation between forward–backward displacement of the center of foot pressure (COP-FB) and forward–backward displacement of landing position in the straight jump (H-FB). A strong positive correlation was observed between COP-FB and H-FB (R = 0.750, p < 0.05), and the movement directions of the two measures tended to match.
Figure 8 shows the results of the correlation analysis between COP-LR and H-LR. A strong positive correlation was observed between COP-LR and H-LR (R = 0.702, p < 0.05). There was a tendency for the amount and direction of displacement in the left–right direction of COP to coincide with the landing position.

![Figure 8](image-url)  
* p < 0.05

4. Discussion

The results of this study show that there was a difference in COP displacement between participant groups only in the eyes-open condition, and there was a strong positive correlation between the COP displacement and the landing position. Therefore, the null hypothesis was rejected.

Postural muscles are responsible for standing control against forward-leaning posture and they increase the sensitivity of somatosensory input in postural control [21,22]. Because occlusion is related to somatosensory and vestibular input, there are many reports on the effects of occlusal conditions and the wearing of oral appliances on postural control function [14,19,23,24]. Moreover, because visual input provides the relative positional information about surrounding objects, it serves as a source of information about head position and movement, reduces COP sway, and is crucial for postural orientation [3,25,26]. In addition, the threshold for sensory input due to postural sway differs according to the sway speed [21]. It has been reported that the proprioceptive threshold is lowest for static or slow motion, while the proprioceptive and visual input thresholds are low for rapid motion. This suggests that the prioritization of sensory input in sports adapts to the characteristics of the sport [27,28]. Because gymnasts focus on balance training [12], their balance abilities tend to be superior to those of the general public and athletes in other sports [4–8,15]. Gymnastics events include artistic gymnastics, rhythmic gymnastics, trampoline, acrobatic gymnastics, and parkour [29]. Athletes in each event have a characteristic body shape that matches the sport [12,14], and from this we can see the difference in body structure and the skills of each part of the body that result in specialization for an event. Following on from a previous study which revealed that equalization of the occlusal contact state by wearing a mouthguard contributed to the improvement of the static postural control function [14], the focus was on trampoline competition, where postural control function is reflected in competition skill [14,15]. As a next stage of investigation, the purpose of this study was to clarify the relationship between trampoline performance and standing
postural control function. First, we compared the center of gravity sway of healthy men and trampoline gymnasts, with a prerequisite that occlusal balance was stable and there were no differences in occlusal conditions. There is a previous report indicating that the postural control function is exhibited only under conditions that match the practice environment [6]. In addition, because the prioritization of sensory input in postural control differs according to the level of competition [30,31], it was considered desirable to recruit high-level athletes. Therefore, male gymnasts who received practical training from coaches of the Japanese Olympic team and were supported by physical therapists were selected as participants for this study.

There was no significant difference in COP displacement between the eyes-open and eyes-closed conditions in either the healthy men or the trampoline gymnasts. From this result, it was confirmed that the importance of visual input in maintaining standing posture is low, as previously reported [3]. Differences between participant groups were observed in COP-FB only in the eyes-open condition, and the trampoline gymnasts had better postural control function compared with the healthy men. It has been reported that postural control function differs according to an athlete’s sport and level of competition [4–8]. In other words, gymnasts, for whom posture training is emphasized, have superior postural control function compared with other athletes, and this function is demonstrated only under conditions that are particularly compatible with the training environment [6]. The participants in this study were trampoline gymnasts, for whom posture training and training conditions involve standing on both feet with the eyes open. This may be why they exhibited better postural control function compared with healthy men only under the eyes-open condition. Although COP-LR tended to be lower in the trampoline gymnasts, it is possible that the lack of a significant difference was due to the large standard deviation in the amount of displacement.

Studies on postural stability and performance in gymnasts have shown that balance ability is related to competition level, that elite-level athletes have better balance ability, and that there are significant relationships between balance ability and many performance indicators [6,32–36]. However, with respect to trampoline competition, there have been some physiological studies [37,38], but few reports on performance and postural control function [39,40]. Regarding the relationship between static postural control function and physical performance, a significant and strong positive correlation was observed between the direction/distance of horizontal displacement in consecutive straight jumps and the direction/amount of displacement of the COP. In other words, the smaller the displacement of the COP, the closer the landing position was to the center of the bed. From this, it is suggested that gymnasts with excellent standing postural control function stabilized their landing position in straight jumps. Trampoline gymnasts are trained to maintain a standing posture in which the shoulders, hip joints, knees, and ankles are in a straight line and the COM is distributed over the soles of the feet. This posture is the basis for the flight posture. The results of this study provide further evidence that improving the ability to maintain a static posture leads to a stable jumping posture, thereby reflecting the training effect. Efficient take-off is essential for the next jump to make the most of the repulsive force of the bed. To achieve this, it is necessary to land in the center of the bed, which leads to securing jump height and flight time. Furthermore, the extension of the flight time also affects the number of rotations and twists, so the landing position may affect the entire performance. On the other hand, disturbance of the landing position may cause serious problems such as falling outside the trampoline frame. In the case of serious sports injuries such as cervical spine injury, there is a latent possibility that it will lead to serious disability not only during the person’s sports life but also for the rest of their life.

This study revealed a strong positive correlation between the static center of gravity sway and the displacement direction of the landing position. In other words, the landing posture of trampoline gymnasts in continuous straight jumps reflected the standing postural control function. The trial in this study was straight jumps, but jumps that involve rotation and twists have a shorter flight time, so the preparation time until landing is
limited [12,13,40,41]. In any jump technique, preparations for landing are made while maintaining an upright posture in the air [14,41], so improving the standing postural control function may lead to stable landing. In addition, the presence or absence of specialized knowledge of athletes affects postural control and competition skills [42–44]. It is expected that feeding back the results of this study to gymnasts and further strengthening of balance training will lead to improvement of the landing position, that is, improvement of H-score.

The main limitation of this study was that the number of trampoline gymnasts was small, and it was not possible to compare the difference between stable and unstable occlusal balance. It is necessary to continue investigations over the coming years, ask for cooperation from trampoline gymnasts with a certain level of competition experience, and clarify the effects of occlusal balance. Furthermore, we could examine how much correction of occlusal balance by wearing a mouthguard contributes to the stabilization of the landing position for trampoline gymnasts with unstable occlusal balance. By conducting these verifications, health management of the stomatognathic region or occlusal management may become important for safe sports, and we can expect the possibility of contributing to the reduction of sports injuries and the improvement of competitiveness.

5. Conclusions

This study clarified that the postural control function of trampoline gymnasts was superior to that of healthy men under eyes-open conditions. Additionally, it was suggested that the landing position during consecutive straight jumps of trampoline gymnasts with stable occlusal balance reflects standing postural control function. Feeding back the importance of standing postural control function in trampoline competition to gymnasts as specialized knowledge and conducting training to improve this function can be expected to lead to the improvement of landing position, that is, improvement of competition skills.

Author Contributions: Conceptualization, M.T. and Y.B.; methodology, M.T.; validation, M.T., Y.B. and T.F.; formal analysis, M.T.; investigation, M.T., Y.B., T.F. and A.M.; resources, M.T.; data curation, M.T., Y.B., T.F. and A.M.; writing—original draft preparation, M.T.; writing—review and editing, Y.B., T.F., A.M. and M.S. supervision, M.T.; project administration, M.T.; funding acquisition, M.T. All authors have read and agreed to the published version of the manuscript.

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References
6. Asseman, F.B.; Caron, O.; Crémieux, J. Are there specific conditions for which expertise in gymnastics could have an effect on postural control and performance? Gait Posture 2008, 27, 76–81. [CrossRef]
15. Takahashi, M.; Bando, Y.; Fukui, T.; Maruyama, A.; Sugita, M. Equalization of the occlusal state by wearing a mouthguard contributes to improving postural control function. *Appl. Sci.* 2023, 13, 4342. [CrossRef]
27. Diener, H.C.; Dichgans, J.; Guschlbauer, B.; Mau, H. The significance of proprioception on postural stabilization as assessed by ischemia. *Brain Res.* 1998, 47, 103–110. [CrossRef]
32. Asseman, F.; Caron, O.; Crémieux, J. Is there a transfer of postural ability from specific to unspecified postures in elite gymnasts? *Neurosci. Lett.* 2004, 358, 83–86. [CrossRef]

43. Paillard, T. Relationship between sport expertise and postural skills. *Front. Psychol.* 2019, 10, 1428. [CrossRef] [PubMed]


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