Traditional balance and slackline training are associated with task-specific adaptations as assessed with sensorimotor tests

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Abstract
The purpose of this study was to measure alterations in sensorimotor skills and balance resulting from slackline training and conventional balance training. Forty-three physically fit subjects were randomized into three groups. Two groups practiced three times a week for 15 minutes, including at least once supervised session, on the slackline or perform conventional balance training for 6 weeks. The control group was not allowed to perform any balance training. Before and after the intervention, the subjects underwent sensorimotor and strength tests. The results of our intra-class correlation analysis showed that the stability parameters from the multifunctional training device (MFT, 0.7), the height during the countermovement jump (CMJ, 0.95) and the maximum force (0.88) during leg press showed excellent reliability. A post hoc comparison indicated a larger effect of conventional training (almost 11% reduction in MFT stability) compared with slackline training in group-wide comparisons of the pre- to the post-training measurements. The factor analysis showed that stability and sensorimotor assessment using MFT were correlated, as were height during CMJ and maximal force during leg press, which represented dynamic strength. Because CMJ had the highest intra-class correlation value, it was chosen over maximum force from leg press. For these reasons, only two out of nine measured parameters, namely MFT stability and CMJ, were analysed across groups. The only observed difference between the two groups was MFT stability (slackline − 1.5%, conventional − 13%), whereas the improvement of CMJ was the same (slackline + 3%, conventional + 3%). It can be concluded that slacklining is partly complementary to conventional sensorimotor training.

Keywords: Rehabilitation, stability, posture, muscle force, coordinative performance

Highlights
• Slacklining is partly complementary to conventional sensorimotor training.
• High to excellent levels of reliability were observed for the MFT stability parameters, height during the CMJ and the maximum force produced by pushing against the leg press.
• A significant main effect of training allocation was observed for CMJ height suggesting an increase in jumping height irrespective of the training paradigm (slacklining or conventional sensorimotor training).

Introduction
Postural control or balance can be defined statically as the ability to maintain a base of support with minimal movement and dynamically as the ability to perform a task while maintaining a stable position (Winter, Patla, & Frank, 1990). Balance, defined in the context of physical education (Cappa, Di Rosa, & Patanè, 2005) as the maintenance of equilibrium while stationary or moving, is a skill-related component of physical fitness that relates to movement performance. This skill-related component is often part of the planned instruction content for PE programmes that will result in measurable gains in knowledge and skill for all students; cf. Academic standards for health, safety & physical education (Anonymous, 2003). Appropriate practice expectations for PE teachers include planning assessments that reflect students’ learning about and performance of...
physical activity (Monti, 2004). Athletic trainers and coaches of athletes involved in competitive sports are mainly interested in improving balance skills as a means of preventing injury (DiStefano, Clark, & Padua, 2009; McKeon & Hertel, 2008; Webster & Gribble, 2010).

Sensorimotor training (SMT) aims to enhance the performance of the sensorimotor system. SMT emphasizes postural control and progressively challenging the sensorimotor system to restore normal motor programmes, and it often applies simple rehabilitation tools such as balance boards, foam pads and elastic bands to improve balance (Page, 2006). When programmes are designed with the aim of improving balance, it is important that exercises progress from static balance tasks in a comfortable environment towards more challenging dynamic balance activities on unstable surfaces (DiStefano et al., 2009). It has been shown that balance training can enhance lower extremity muscular strength (Heitkamp, Horstmann, Mayer, Weller, & Dickhuth, 2001). Programmes that are performed at least 3 times per week for 4 weeks and include some type of progressive dynamic balance training appear to have the best results (DiStefano et al., 2009).

Slacklining involves balancing on a 2.5- to 5-cm-wide band of nylon webbing stretched between two anchor points. Because of the band’s elasticity, the line always see-saws under the body, in contrast to tightrope walking. An important additional factor in slackline training is that it is more motivating than conventional SMT and, therefore, athletes are highly interested in integrating it into their training schedule (Frank & Rist, 2009). Many top athletes use the slackline to improve their balance (Kroiss, 2007); however, to the authors’ knowledge, there are only four studies available that have investigated the effects of slacklining on deficits in postural control and muscle strength (Donath et al., 2013; Donath, Roth, Zahner, & Faude, 2015, 2016; Granacher, Iten, Roth, & Gollhofer, 2010) and the spinal adaptations that accompany slackline training (Keller, Pfisterschmied, Buchecker, Müller, & Taube, 2011). These studies revealed that a positive influence on the rate of force development in the plantar flexors (Granacher et al., 2010), slackline-specific balance improvements only (Donath et al., 2013), no transfer effects of slackline training to ankle strength measures (Donath et al., 2015) and changes in Ia-afferent transmission (Keller et al., 2011).

What seems to be lacking in this line of research is knowledge regarding whether different types of balance training, e.g. SMT with wobble boards and slackline training, are complementary in their effects on the various aspects of balance control and thus show differences in performance on different balance and strength tests. Such information could help to improve the evidence-based rationale of therapy designs for the individuals who stand to gain the greatest benefit. The purpose of the present study, therefore, was to investigate and contrast the effects of slackline training and conventional SMT balance training on measures of balance and maximal force. We hypothesized that the different training tasks would show different effects on outcomes of static and dynamic balance and leg muscle strength. We further hypothesized that the slackline group would show differences in motivation for participating in the training compared with the conventional training group.

**Methods**

**Experimental approach to the problem**

The goal of this study was to compare 6 weeks of traditional SMT training with slackline training and to examine the effects of these types of training on balance and leg muscle performance characteristics.

**Subjects**

Forty-seven PE students in the first-semester PE classes for Human Movement Sciences and Sport at the ETH Zurich were asked to volunteer for this study. The ETH ethics committee approved the project, and the subjects were included after the receipt of a signed written informed consent form. The participants were randomized to 1 of 3 treatment arms: traditional sensorimotor training (tSMT) including various stages, as shown in the supplementary tables; slackline training (SLT) or control (CON). The exclusion criteria consisted of being unable to perform the tests and/or training without pain, not being healthy by self-report and currently participating in a structured balance exercise programme. All the subjects were new to this type of testing and training. Of the 47 healthy and physically fit subjects who volunteered, 43 underwent baseline testing (Table I).

**Procedures**

**Sensorimotor and slackline training protocols.** For 6 weeks, the tSMT and SLT groups trained 3 times a week for 15 minutes of net training time per session. Besides one mandatory supervised training, the subjects had the opportunity to train several times a week.

For the SLT group, the slackline was attached horizontally to two anchor points approximately
60 cm above ground level. The training included balance tasks on one foot or both feet. The SLT group trained on slacklines of different types, lengths, widths and sags (supplementary tables).

A global approach to tSMT that included a ‘static’ and a ‘dynamic’ stage, according to Page (2006), was chosen. This group trained alternately on rocker-roller boards (Vew-Do, Manchester Center, USA), balance pads (Airex, Sins, Switzerland), AERO-Steps (TOGU, Prien-Bachham, Germany), wobble boards and rocker boards.

All the participants in the tSMT and the SLT group were supplied with an AERO-Step and a rocker board (tSMT) or a slackline (SLT) for use at home. All the groups were allowed to perform their usual sports training as long as it did not include other groups training. The participants had to provide a training log.

Sensorimotor tests

Prior to and after the intervention, all the subjects performed an opening assessment consisting of four different sensorimotor tests. The whole procedure lasted approximately 30 minutes. Prior to the tests, the subjects warmed up for 10 minutes on a bicycle ergometer at moderate speed and then completed a questionnaire regarding their self-perceived state of health. At the final assessment, the subjects completed a questionnaire regarding their motivation during the intervention. All sensorimotor tests were performed in random order determined using a randomizing function (MS Excel), and the participants were barefoot to avoid variations caused by different types of shoes. The four tests showed a reasonable day-to-day consistency (Volery et al., 2010).

Single-leg jump landing. For the single-leg jump landing from 36 cm height, the subjects were instructed to hold a stable position on the dominant foot on the platform. They had to land as precisely as possible on a default mark on the force plate and maintain the position until they had held a stable position for 3 seconds. The measurement was invalid when the non-dominant foot or another extremity touched the ground or the platform.

Time to stabilization (TTS) expresses how long it takes a person to stabilize their ground reaction force after a jump landing. People with a low MFT S3 wobble board performance have longer TTS values (Gribble & Robinson, 2009; Wikstrom, Tillman, & Borsa, 2005). TTS values can be expressed in terms of vertical, medio-lateral or anterior–posterior ground reaction forces. It has been shown that people with functional ankle instability have higher TTS values in the medio-lateral and the anterior–posterior plane (Ross, Guskiewicz, & Yu, 2005).

Using a force plate (Kistler, Winterthur, Switzerland), the vertical, medio-lateral and anterior–posterior ground reaction forces were measured at 2000 Hz. The TTS scores were calculated with the sequential estimation method using an algorithm to calculate a cumulative average (Gribble & Robinson, 2009; Ross et al., 2005; Wikstrom et al., 2005).

The medio-lateral displacement of the knee was measured by filming the frontal plane movement of a cross that has been marked with a pen on each subject’s knee by the same investigator following a standard procedure. These videos were then evaluated using video tracking software (Skill Spector, video4-coach, Svendborg, Denmark). This test has previously shown good reliability (Wikstrom, Tillman, Kline, & Borsa, 2006).

Multifunctional training device S3-check. The MFT S3-Check is a testing device with an unstable support surface that has shown moderate to high correlations in objectivity and reliability tests (Raschner et al., 2008). The MFT board is a wobble board that can be tilted up to 12° to the left or the right or from front to back, depending on the participant’s standing position on the board. In this study, deflections to the side were measured. The sample rate was 100 Hz,

### Table I. The three group allocations within the study

|          | Age [years] | Height [m] | Weight [kg] | Gender |
|----------|-------------|------------|-------------|--------|
| CON      | 20.3 ± 2.2  | 1.71 ± 0.08| 62 ± 9      | 5m, 8f |
| tSMT     | 20.8 ± 1.4  | 1.69 ± 0.05| 61 ± 7      | 5m, 10f|
| SLT      | 21.0 ± 1.8  | 1.71 ± 0.05| 63 ± 6      | 5m, 10f|
| p        | .584*       | .691*      | .749*       | .95**  |

Notes: CON is the control group, tSMT the traditional sensorimotor training group and SLT the slackline group. Statistically, no differences were found between these groups in terms of age, height or weight. Mean (±standard deviations). The groups were fairly well balanced in terms of gender.

*One-way ANOVA.
**Chi-square test.
and the measurement accuracy was 0.5° (Raschner et al., 2008). The testing device measures the movements of the platform and automatically calculates the ‘sensorimotor index’ (Raschner et al., 2008). Deflection from the horizontal position is expressed as the ‘symmetry index’. Both factors are combined to produce the ‘stability index’. The sensorimotor and the stability index values are expressed on a scale from 1 to 9, in which 1 stands for ‘very good’ and 9 for ‘very poor’.

For the MFT S3-Check, the subjects were instructed to stay as calm as possible on an MFT platform for 30 seconds with their arms akimbo.

**Countermovement jump.** Explosive force was quantified using the jump height performance parameter for a two-legged countermovement jump (CMJ). This test was performed on the Quattro Jump (Kistler, Winterthur, Switzerland) at 500 Hz, and the standard calculation for the jump height based on the flight time was used. The subjects had to position themselves with arms akimbo on the platform. This test has previously been shown to be a reliable and valid field test for estimating the explosive power of the lower limbs (Markovic, Dizdar, Jukic, & Cardinale, 2004).

**Leg press.** Maximal strength was measured on a blocked 45° leg press. A force plate (Kistler, Winterthur, Switzerland) was affixed to the carriage on which weight disks are usually appended. The leg press was blocked at a knee angle of 90°.

The subjects were instructed to push as hard as possible on the carriage and to maintain their maximal strength for 3 seconds. This test can be used to reliably assess neuromuscular function (Spiering et al., 2011).

Except CMJ (5 times), all tests were repeated 3 times and the mean of the 2 best trials was used for data processing and analyses in Matlab R2013b (Matlab, USA).

**Statistical analyses**

**Reliability of sensorimotor tests.** Intra-class correlations (ICCs) between pre- and post-tests were calculated for the control group only. Because the mean values of several trials were used in the analysis and the tests were always supervised by the same raters, the ICC3,3 was applied (for a detailed description of the ICC, see Rankin & Stokes, 1998). The ICC3,3 was categorized as poor (0–0.39), moderate (0.40–0.59), high (0.60–0.79) or excellent (0.80–1) according to Landis and Koch (1977).

**Factor analysis.** Postural control impairments have not been consistently detected with more traditional measures (McKeon & Hertel, 2008), and balance assessment methods that include moving or open environments are rather scarce (Huxham, Goldie, & Patla, 2001). Therefore, a total of nine sensorimotor test parameters were extracted to evaluate the effect of the various training protocols. To establish correlations among different sensorimotor parameters and to reduce the effective dimensions of the entire dataset, factor analysis (FA) was performed using the FACTOR procedure. The correlation analysis method was used to extract the principal components before the FA was performed using the ‘VARIMAX’ procedure. The Kaiser criterion was used to extract the appropriate number of components that represent the original data set.

**Effects of training.** A mixed FA of variance was used to analyse the effect of different training paradigms. Here, only the sensorimotor test parameters that displayed high to excellent levels of reliability (ICC > 0.8) and represented unique components of the PCA were selected. Furthermore, FA was used to categorize these parameters, and only one parameter per category was chosen as the dependent variable. The independent variables were the type of training programme (with three levels: slackline training group, conventional training group and control group) and the allocation of the training programme (with two levels: pre- and post-training). The interaction between the type of training and allocation of training was also investigated. Furthermore, age, height and weight were entered as covariates in the statistical model. Significance was set at \( p < .05 \), and post hoc comparisons were conducted using least significant differences (LSD).

**Subjective assessment of the training programme.** The differences in the subjective assessments of the training programme were evaluated using a one-way analysis of variance (ANOVA) as the F-test is robust against the violations that might be present in non-continuous data series (Carifio & Perla, 2007).

All the statistical analyses were conducted with SPSS (SPSS v. 21, IBM, USA).

**Results**

**Participant description**

There were no significant group differences in age, height, weight (Table I) or the pre-test parameters
of MFT_Stability \((p = .4)\) and CMJ_height \((p = .15)\) (Table II).

**Reliability of the sensorimotor tests**

The ICC\(_{3,3}\) values showed high to excellent levels of reliability for the MFT stability parameters, height during the CMJ and the maximum force produced by pushing against the leg press (Table II).

**Principal component analysis**

A total of five iterations were required for the FA procedure to converge at four components. These four components were associated with all nine of the original components based on the extracted and weighted coefficients (Table III). The larger the coefficient, the higher the correlation between the factor (or category) and the sensorimotor test parameter. Consequently, the first factor represented all the time to stabilization parameters and was interpreted as TTS. Similarly, the second factor represented balance characteristics, the third represented strength and the fourth factor represented the range of motion (ROM) at the knee joint.

**Effects of training**

The results of the reliability analysis and the FA were combined to effectively reduce the number

|                 | Slackline Mean ± SD | Conventional Mean ± SD | Control Mean ± SD | ICC |
|-----------------|---------------------|------------------------|------------------|-----|
| **TTS medio-lateral [s]** Pre | 1.49 ± 0.09 | 1.49 ± 0.08 | 1.44 ± 0.08 | 0.54 |
|                 | Post | 1.40 ± 0.07 | 1.45 ± 0.080 | 1.41 ± 0.06 | 0.44 |
| **TTS anterior-posterior [s]** Pre | 1.40 ± 0.05 | 1.39 ± 0.05 | 1.38 ± 0.04 | 1.35 ± 0.03 |
|                 | Post | 1.33 ± 0.08 | 1.31 ± 0.04 | 1.32 ± 0.07 | 0.56 |
| **TTS vertical [s]** Pre | 1.29 ± 0.08 | 1.32 ± 0.04 | 1.30 ± 0.06 | 0.21 |
|                 | Post | 7.30 ± 2.77 | 5.55 ± 1.52 | 6.63 ± 2.66 | 0.70 |
| **Knee displacement [cm]** Pre | 4.09 ± 1.66 | 4.32 ± 0.79 | 4.39 ± 0.91 | 0.90 |
|                 | Post | 5.37 ± 0.50 | 5.08 ± 0.73 | 5.11 ± 0.61 | 0.70 |
| **MFT stability** Pre | 4.65 ± 0.61 | 4.32 ± 0.68 | 4.50 ± 0.70 | 0.55 |
|                 | Post | 4.46 ± 0.60 | 3.93 ± 0.54 | 4.23 ± 0.52 | 0.23 |
| **MFT sensorimotor** Pre | 4.6 ± 3.0 | 5.0 ± 4.0 | 3.8 ± 2.7 | 4.1 ± 2.7 |
|                 | Post | 5.4 ± 3.9 | 4.3 ± 2.7 | 4.1 ± 2.7 | 0.95 |
| **CMJ jump height [cm]** Pre | 39.8 ± 9.0 | 37.4 ± 9.7 | 41.1 ± 7.4 | 0.95 |
|                 | Post | 41.1 ± 10.4 | 38.6 ± 9.8 | 40.9 ± 7.6 | 0.95 |
| **LP Fmax [N]** Pre | 2053 ± 657 | 2131 ± 675 | 2099 ± 735 | 0.88 |
|                 | Post | 2130 ± 695 | 2230 ± 868 | 2011 ± 627 | 0.88 |

Note: The values are group mean ± standard deviation (SD).

Table III. Factor analysis revealed four factors, namely time to stability, balance, strength and symmetry, that represented the entire sensorimotor test outcome parameter battery

| Factor 1: TTS | Factor 2: balance | Factor 3: strength | Factor 4: symmetry |
|---------------|-------------------|-------------------|-------------------|
| MFT_stability | 0.96              |                   |                   |
| MFT_sensorimotor | 0.85         |                   |                   |
| MFT_symmetry |                   | 0.91              | −0.48             |
| CMJ_height [cm] |                   |                   | 0.96              |
| Knee displacement (ROM) [cm] | 0.41 |                   |                   |
| TTS_ML [s] | 0.87              |                   |                   |
| TTS_AP [s] | 0.88              |                   |                   |
| TTS_FZ [s] | 0.88              |                   |                   |
| Leg press Fmax [N] |                   | 0.92              |                   |

Notes: As only three parameters reached sufficient levels of reliability and represented the unique features in the factor analysis, these were considered for further analysis. The table indicates factor loadings where the values of factor loadings are results of the pattern matrix.
of relevant dependent variables. The dependent variables with high to excellent reliability (ICC3,3 > 0.6) that represented the various factors were chosen. The chosen dependent variables, therefore, were MFT stability (Factor 2: balance) and CMJ height (Factor 3: strength). None of the parameters representing Factor 1 (TTS) or Factor 4 (ROM) had high excellent levels of reliability and were therefore excluded from further analysis. Because only two parameters (MFT stability and CMJ height) were used as dependent measures in the mixed-factors ANOVA, a conservative adjustment of the level of significance was deemed unnecessary.

**MFT stability.** A significant main effect of training allocation was observed ($p < .001$) (Figure 1). More importantly, a significant interaction effect of training type and group allocation ($p = .009$) was present. A post hoc comparison indicated a larger effect of conventional training (almost 11% reduction in MFT stability) compared with the slackline training paradigm in group-wide comparisons of the pre- and post-training conditions (Table II). Furthermore, height had a significant effect on MFT stability parameters ($p = .03$).

**CMJ height.** A significant main effect of training allocation was observed for CMJ height ($p = .027$), suggesting an increase in jumping height irrespective of the training paradigm (Table II). Furthermore, a significant effect of weight was observed for CMJ height ($p = .031$).

**Questionnaire**

The slackline group felt that their ankle stability, performance in other sports and balance skills were improved (Supplementary Figure 1).

**Discussion**

The purpose of the present study was to investigate and compare the effects of slackline training and conventional SMT balance training on measures of balance. Most balance conditioning programmes for sports and rehabilitation are multifaceted, and it is often unknown how each training component contributes to the overall performance. The need for studies that determine the effects of different forms of balance training on motor skills – e.g. using tests that consider the competing processing demands of the environment when analysing balancing skills (Huxham et al., 2001) – has previously been
identified (Hrysomallis, 2011). The results of traditional and slackline balance training programs, as assessed with more challenging tasks in our study, were compared with the results of a non-balance training control group. This allowed an evaluation of the contribution of the separate balance training components. The results revealed that although both slackline training and conventional SMT led to improvements in sensorimotor skills, differences were observed in the outcome parameters affected by the two programmes. Our results also showed that of all the parameters considered here for assessing sensorimotor performance, only three measures — namely, MFT stability, CMJ height and peak force during leg press — reached the acceptable high excellent levels of reliability; therefore, other parameters (e.g. time to stability measures) must be interpreted with caution. Furthermore, our results from the FA showed that the stability and sensorimotor parameters of MFT outcomes were highly correlated with each other but were distinct from the symmetry outcome. CMJ was selected because it has higher reliability than LP Fmax and is highly correlated with LP Fmax; therefore, the information based on these two parameters is similar. Based on these findings, only CMJ and MFT stability were included in further analyses of training efficiency among the groups.

Interestingly, the symmetry outcome of the MFT correlated well with jump height during the CMJ task but not with peak force during the leg press task. Because the jump heights achieved in the CMJ task were correlated with both the MFT symmetry index and the peak force measured during the leg press task, this parameter might be suited for assessing both strength and coordination in the lower extremity. This is especially likely because jump height showed the highest levels of reliability among all parameters. Finally, we observed training-specific effects on MFT stability; improvements were observed only in those participants who underwent traditional (or conventional) SMT, while those who trained with slackline tasks did not show any significant improvements. Improvements in CMJ were observed irrespective of the type of training paradigm. These results have direct implications on the selection of training paradigms and the outcome parameters used to assess sensorimotor and balance performance.

These results seem consistent with a recent balance training intervention that showed somewhat task-specific effects of balance training (Giboin, Gruber, & Kramer, 2015). A possible explanation for these seemingly contradictory findings might be the fact that generic balance tasks are used as outcomes in many studies. Generic measures, however, have little value for assessing overall balance measures or the effects of training interventions (Kummel, Kramer, Giboin, & Gruber, 2016). The inability to objectively assess the highest level of balance with adequate tests is believed to be an important contributor to the poor predictive ability of many tests (Huxham et al., 2001). A need for balance assessments that include movement or open environments and thereby consider the biomechanical and information processing demands imposed by the task and environmental context has been identified (Huxham et al., 2001). It can be speculated that at least part of the contradictory findings reported in the literature is attributable to the misfit between balance training content and the training assessments applied. Although the inclusion of subjects who were naive to the test setup could have influenced our ICC values, the participants were allowed to familiarize themselves with the measurement protocols, thereby ensuring that the measurements were reliable.

Previous investigations with children showed that they were less stable (Scharli, Keller, Lorenzetti, Murer, & van de Langenberg, 2013) and that slackline training had no effect on jumping performance, muscle strength and power (Donath et al., 2013). When height during a CMJ test is used to assess performance during a training program, participants within groups should be matched in terms of body weight (body weight has a significant effect on CMJ). Maximal strength, measured as the peak force during the leg press, was highly correlated with the jump height during the CMJ test; however, the peak force during the leg press revealed excellent ICC levels (Table II). The outcomes of former studies (Granacher, Gruber, Strass, & Gollhofer, 2007; Gruber & Gollhofer, 2004) showing that no improvements in isometric maximal strength can be obtained with conventional SMT were confirmed. However, the slackline group achieved improvements in maximal strength. It seems unlikely that the improvements on this strength resulted from a learning effect as the movement was simple, and the control group did not show any improvement. Further investigation is needed to determine whether a longer intervention leads to different effects.

The finding that three of the seven questions were answered more positively by the slackline group might indicate that slackline training could positively influence performance in other sports for mental reasons, which are important aspects in sport. Studies show that good self-confidence is reflected in performance (Hays, Thomas, Maynard, & Bawden, 2009).

Although instrumented measures of postural control have been used in the attempt to assess sensorimotor deficits, the disparate measures and
methods reported in the literature make interpreting and comparing these results daunting (McKeon & Hertel, 2008). As a possible additional limitation, it should be mentioned that the number of trials used for the analysis was not the same for all tests; however, the two best attempts were averaged in all cases. Furthermore, the subjects had to attend only one supervised training, and all other training sessions were either performed independently or with freely chosen supervision. This might have resulted in a bias between the two intervention groups. In addition, we only analysed two of the nine test parameters. Without the PCA and the ICC checks of the tests, it is likely that different test parameters would have been analysed. However, it seems to be important to focus only on reliable and valid test parameters. However, our results for the two interventions group using different types of SMT showed that one performance parameter was enhanced in a group-specific manner. This suggests that training on a slackline and SMT with wobble boards are indeed partly complementary in their effects and thus encourage different adaptations.

**Outlook**

The slackline seems to have potential not only as an established SMT device for athletes but also as a rehabilitation training device. Initial studies focusing on these groups have been performed (Donath et al., 2013); however, their results contrast somewhat with the results of our study. Recently, some efforts have been made to demonstrate that slacklining may be a valid cross-training tool for female basketball players because it enhances postural control and jump performance (Santos et al., 2015). Furthermore, in older adults, slackline training has been found to induce large task-specific improvements in slackline standing performance accompanied by reductions in lower limb and trunk muscle activity (Donath et al., 2015). Whether these training effects would also transfer to falls among older adults remains to be investigated.

**Practical applications**

This study showed differing effects of two forms of SMT aimed at improving balance. Significant improvements were found in the sensorimotor performance of both intervention groups after a total training time of 270 minutes.

The conducted tests showed that SMT is somewhat training movement specific. Subjectively, the slackliners reported impressions of greater progress compared with the other groups. Therefore, we conclude that slacklining appears to be a relevant addition to conventional SMT because it can potentially affect other balance-related outcomes that conventional SMT. With this insight, PE teachers and athletic trainers may prescribe balance exercises more effectively to students and athletes with different sports backgrounds that show different abilities in static and dynamic balance skills (Bressel, Yonker, Kras, & Heath, 2007). Further research in other populations is warranted to substantiate or refute these findings.

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**Disclosure statement**

Samuel Volery is co-owner of the company slackactivity.ch.

**Supplemental data**

Supplemental data for this article can be accessed here (https://doi.org/10.1080/17461391.2017.1317833).

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