Rolfing® SI and Sports

Structural Integration 10-Series Effects on Balance and Postural Alignment in Soccer Players

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This research abstract is a reformatting of a poster presentation by researchers at Western Washington University, including Certified Advanced Rolfers™ Russell Stolzoff and Brad Jones. The poster was presented at the November 2018 Fascia Research Congress in Berlin, Germany. The study was conducted in 2014.

Image of soccer player not part of original presentation.

ABSTRACT

BACKGROUND Structural integration is a manual therapy that focuses on whole body functionality[6]. The mechanisms and effectiveness of the treatment, however, are still not well known. Fascia, which is affected largely by tension and has proprioceptive capabilities based on the function of mechanoreceptors[14], may underlie the effects. The purpose of this study was to determine if structural integration could affect balance and structural alignment in recreational soccer players.

METHODS Twenty subjects (age: 29.0±4.8 yr; height: 1.72±0.1 m; weight: 72.0±11.3 kg) with no ankle injuries in the past 6 months were randomly assigned to two groups; the treatment group underwent structural integration for 10 weeks and the control group with no treatment. Pre- and post-measures included balance assessment, with the 10 treatment subjects having pre- and post-photos in frontal and sagittal views. Balance was evaluated with center of pressure (COP) excursion, in the mediolateral (COPx) and anteroposterior (COPy) directions, measured on a force platform during four conditions of a balance test. Photo images were digitzed as JPG files using MaxTRAQ. Statistical analysis was done using a 2-way mixed ANOVA for COP, and dependent t-tests for postural alignment variables. Effect sizes were calculated.

RESULTS For balance, there was not a significant three way interaction between time, group, and condition for both COPx ($p = 0.285$; partial $\eta 2 = 0.067$) and COPy ($p = 0.212$; partial $\eta 2 = 0.085$) excursion but there was a significant time and condition interaction for both COPx ($p = 0.001$; partial $\eta 2 = 0.350$) and COPy ($p = 0.030$; partial $\eta 2 = 0.211$). For postural alignment, there was no statistical difference in AC tilt ($p = 0.187$; $d=0.166$) but significant improvements in both lateral tilt ($p = 0.022$; $d=0.439$) and anteroposterior spine angle ($p = 0.024$; $d=0.298$).

CONCLUSIONS COP excursion reduced over time across all conditions, hence better balance, but this may be a learning effect as both groups improved. Postural alignment improved by the intervention. Structural integration is a viable intervention for postural alignment in young, physically active subjects.

INTRODUCTION

Structural integration (SI), also known as Rolfing, is a form of treatment that has grown in popularity but mechanisms and effectiveness are not well known. The few studies completed on SI found improved joint range of motion, pain, and symptoms associated with muscular dystonia of the eye [2 7]. Possibly underlying the effects of SI is fascia, which is affected largely by tension and has proprioceptive capabilities based on the function of mechanoreceptors[11 14]. The mechanoreceptors facilitate the sense of joint position and proprioceptive sensations involving muscle length[8]. Mechanoreceptors are found in connective tissue, such as fascia, surrounding muscles, groups of muscles, blood vessels, and nerves[2 9 11 12 15]. With the stimulation of mechanoreceptors, such as prolonged pressure during SI, changes in local fluid dynamics and tissue metabolism as well as global muscle relaxation can occur[9 11]. Changes in the fascia may affect functionality, demonstrated through balance and postural alignment. Balance has only been assessed in one study[3].

The effects of other myofascial manipulation methods, such as self-myofascial release and massage, have been examined more thoroughly than SI. In a recent review, myofascial release techniques were an effective way to restore or enhance range of motion in various joints without a reduction in muscle activity or performance[10].

Research is needed on the effect of SI on balance and postural alignment. If SI can affect one or both of these parameters, future preventative care or rehabilitation could improve functionality.Therefore, the purpose of this study was to determine if SI significantly affected balance or postural alignment in healthy, recreational soccer players.

MATERIALS & METHODS

Design of the Study: This study was a pretest-posttest experimental design. The treatment group underwent SI each week for a total of 10-weeks. Pre- and post-intervention measurements included balance and postural assessment. This study was approved by the university Human Subjects Review Committee.

Subjects: Twenty subjects (10 female, 10 male), aged 22-40 (29±4.8) years old, volunteered to participate in this study. All were currently participating in a recreational soccer league at least once a week and were free from injury for the past 6 months.

Instrumentation: The treatment group (n=10) underwent 10 total SI sessions, consisting of one per week, lasting 10 weeks. Measurements were made at baseline and then within 24-72 hours of the end of the 10-week interval. Balance was evaluated with center of pressure (COP) excursion, in the anteroposterior and mediolateral directions, as measured by a force platform during four conditions of a single-leg balance test. Photo images were digitzed as JPG files using MaxTRAQ.

Procedures:

- Subjects performed a warm-up consisting of five minutes on cycle ergometer at self-selected pace followed by dynamic stretches.
- The balance assessment was carried out on an AMTI (Advanced Mechanical Technology, Inc., Watertown, Massachusetts, USA) OR6-6 force platform collecting at 1200 Hz. Both dominant and non-dominant feet were used in both eyes open (EO) and eyes closed (EC) conditions.
- The subject performed each condition 3 times for 10 seconds in a randomized order. Stopping codes were used for consistency (Springer, Marin, Cyhan, Roberts, & Gill, 2007) and 5 seconds of balancing was required per condition.
- After collection, BioAnalysis with NetForce by AMTI was used to export and analyze the data. The standard deviation of the COP, in the anteroposterior and mediolateral directions, was analyzed to represent COP excursion over the 10-s testing period for each subject
- Frontal and sagittal plane photos were taken pre- and post-intervention in a marked area with a tripod camera. Subjects were instructed to stand in a relaxed manner.

RESULTS

- The results did not support the experimental hypothesis for balance; treatment had a non-significant effect on mediolateral (p=0.677) and anteroposterior (p=0.363) COP excursion (Tables 1 and 2 on page 13).
- For postural alignment, there was a reduction in all spine angles from pre- to post- treatment. There was no statistical difference in AC tilt (p = 0.187; d = 0.166), but significant improvements in both lateral tilt (p = 0.022; d = 0.439) and anteroposterior spine angle (p = 0.024; d = 0.298).

SUMMARY & CONCLUSIONS

The results showed both groups significantly decreased their COP excursion in the mediolateral and anteroposterior directions across all single-leg balance conditions over time. This finding may suggest that the improvements were the result of a learning effect. Improvement in COP excursion, however, may have affected the soccer player's ability to perform during gameplay. It was hypothesized by Barone et al.[1] that proprioceptive training of both legs resulting in improved one-leg standing balance could maximize kicking performance due to the amount of time spent on one leg when striking, passing, or trapping the ball. Additionally, the participants had large standard deviations; this may have affected the interaction significance for balance. Overall, the balance changes appear to be a learning effect in both groups; both improved significantly. It is possible that ten weeks of SI fascial manipulation is not enough time for significant changes between groups.

For postural alignment, the SI treated subjects significantly improved lateral and anteroposterior tilt. The small effect sizes with a significant outcome (p<0.05) may be due to: the small sample size with subjects who were young, physically active, and healthy with inclusion of both sexes. The strong impact may be related to the SI treatment being administered by one certified practitioner. Further research on postural alignment with SI intervention is warranted. The effect may be more substantial in subjects with maligned postural alignment.

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	Eyes closed left		Eyes closed right	
Time	Tx	No Tx	Tx	No Tx
Pre	0.055±0.009	0.068±0.010	0.047±0.009	0.068±0.017
Mild	0.011±0.004	0.006±0.001	0.011±0.004	0.005±0.001
	Eyes open left		**Eyes open right**	
Time	Tx	No Tx	Tx	No Tx
Pre	0.025±0.004	0.027±0.001	0.030±0.006	0.026±0.002
Mid	0.005±0.002	0.003±0.000	0.006±0.003	0.003±0.000

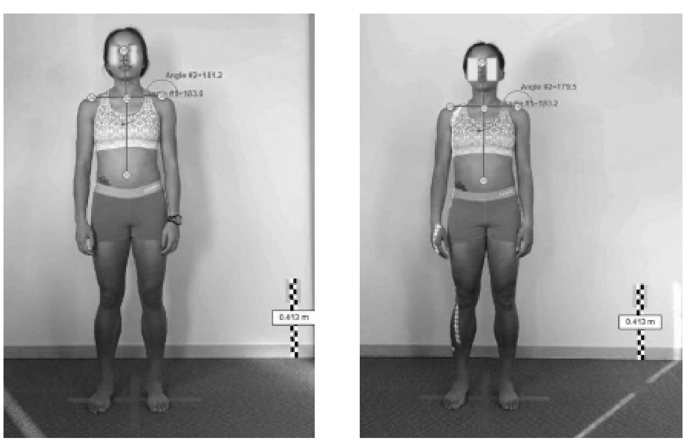
Table 1. COPx excursion mean ± standard error of the mean for each group across the four balance conditions.

	Eyes closed left		Eyes closed right	
Time	Tx	No Tx	Tx	No Tx
Pre	0.055±0.009	0.068±0.010	0.047±0.009	0.068±0.017
Mild	0.011±0.004	0.006±0.001	0.011±0.004	0.005±0.001
	Eyes open left		**Eyes open right**	
Time	Tx	No Tx	Tx	No Tx
Pre	0.025±0.004	0.027±0.001	0.030±0.006	0.026±0.002
Mid	0.005±0.002	0.003±0.000	0.006±0.003	0.003±0.000

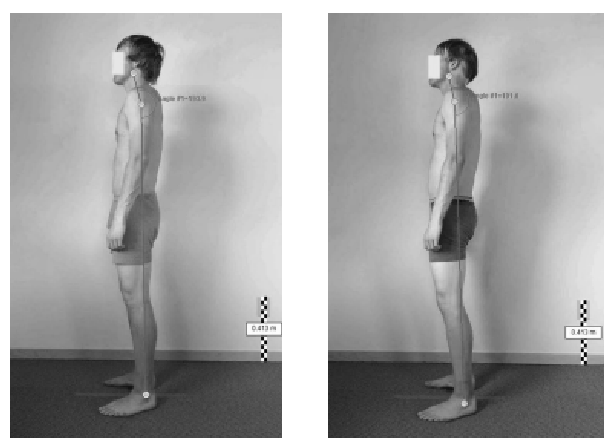
Table 2. COPy excursion mean ± standard error of the mean for each group across the four balance conditions.

	Acromion Tilt	Lateral Tilt	Anteroposterior Tilt
Mean before SI Treatment	0.00026763°	177.3067076°	191.9237992°
Mean after SI Treatment	-0.15236997°	176.6731552°	189.5524369°
p value	0.187	0.022	0.024
Effect Size (Cohen's D)	0.166	0.439	0.298

Table 3. Summary of average changes in spine angle as defined by acromion tilt, lateral tilt, and anteroposterior tilt before and after SI treatment followed by p value and effect size calculated.



Frontal view before and after 10-weeks SI treatment



Sagittal view before and after 10-weeks SI treatment