

TEXTURED INSOLES FOR BALANCE AND GAIT IMPAIRMENTS IN PATIENTS WITH MULTIPLE SCLEROSIS AND PARKINSON'S DISEASE: A SYSTEMATIC REVIEW AND META-ANALYSIS



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Introduction

Patients with neurological diseases, such as multiple sclerosis and Parkinson's disease, show significant balance and gait impairments that could be associated with sensorimotor deficits and decreased foot sole sensitivity. Balance and gait impairments involve increased postural sway (Kerr et al. 2010), reduced gait velocity, step length and stride length (Given et al. 2009) or an altered cadence (Giladi & Nieuwboer 2008, Gorgas et al. 2015, Novak & Novak 2006).

Purpose

To investigate the effects of textured or other types of stimulating insoles on balance and gait characteristics in patients with multiple sclerosis and Parkinson's disease.

Methods

A systematic review of clinical studies was conducted following systematic searches of PubMed, Physiotherapy Evidence Database (PEDro) and Cochrane library (CENTRAL). Studies considered for analysis were selected using the recommendations of Preferred Reporting Items for Systematic reviews and Meta-Analyses (PRISMA). They were included if they investigated the influence of textured or other types of stimulating insoles on balance and/or gait in patients with multiple sclerosis or Parkinson's disease aged >18 years. The outcomes pooled for meta-analysis were the center of pressure (CoP) displacement and CoP velocity for balance as well as cadence, velocity and step length for gait. Quality of the studies was assessed by the author using the 25-item checklist of the CONSORT-Statement. Thereby, a total of 37 sub-items were answered.

A random-effects meta-analysis was conducted to estimate the effects of using the insoles on the outcome variables. For continuous outcomes, standardized mean differences (SMD) with 95% Confidence Intervals (CI) were calculated.

Subtotals were calculated to estimate the treatment effects in the subgroups multiple sclerosis and Parkinson's disease. Furthermore, totals were computed to estimate the treatment effects for all included studies. Finally, heterogeneity between studies was assessed using I²- and Chi²- statistics.

Results

The search identified 29 studies. Six studies met the eligibility criteria and were finally analyzed. Five studies had low methodological quality, scoring <17/37 on the checklist and one study had moderate quality, scoring 27/37. Due to designs of studies, only immediate effects could be calculated. Among the outcome measures of gait, there was no evidence of an effect of using textured/stimulating insoles compared with the respective control condition [Totals: SMD -0.09, 95% CI -0.35 to 0.16 (Fig. 1); SMD 0.18, 95% CI -0.17 to 0.53; SMD -0.13, 95% CI -0.31 to 0.05]. Among the outcome measures CoP displacement and CoP velocity no evidence of an

effect was found as well (Subtotals multiple sclerosis: SMD 0.07, 95% CI -0.15 to 0.28; SMD -0.08, 95% CI -0.55 to 0.39). There was evidence of heterogeneity between all studies (I²=56%, p=0.04) and between subgroups (I²=90.5%, p=0.001) with respect to gait velocity. For CoP displacement and CoP velocity, there was evidence of heterogeneity between the studies and their conditions of the subgroup multiple sclerosis (I²=58%, p=0.008; I²=85%, p<0.001).

Discussion & Conclusions

Using textured or other types of stimulating insoles for the treatment of balance and gait impairments in patients with multiple sclerosis and Parkinson's disease seems to have no effect. Based on only few available studies, the fact that no additional reviewer was consulted for study selection and a risk of biased decisions on study inclusion could be assumed as well as the same studies were used twice or more times without modification on the number of patients in each study there is very low evidence that there is no effect.

Recommendations

Because of some methodological concerns, the results of this systematic review and meta-analysis should be considered with caution and may only serve as preliminary data that need to be revised in the future.

References

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Ethical Approval:

Not applicable

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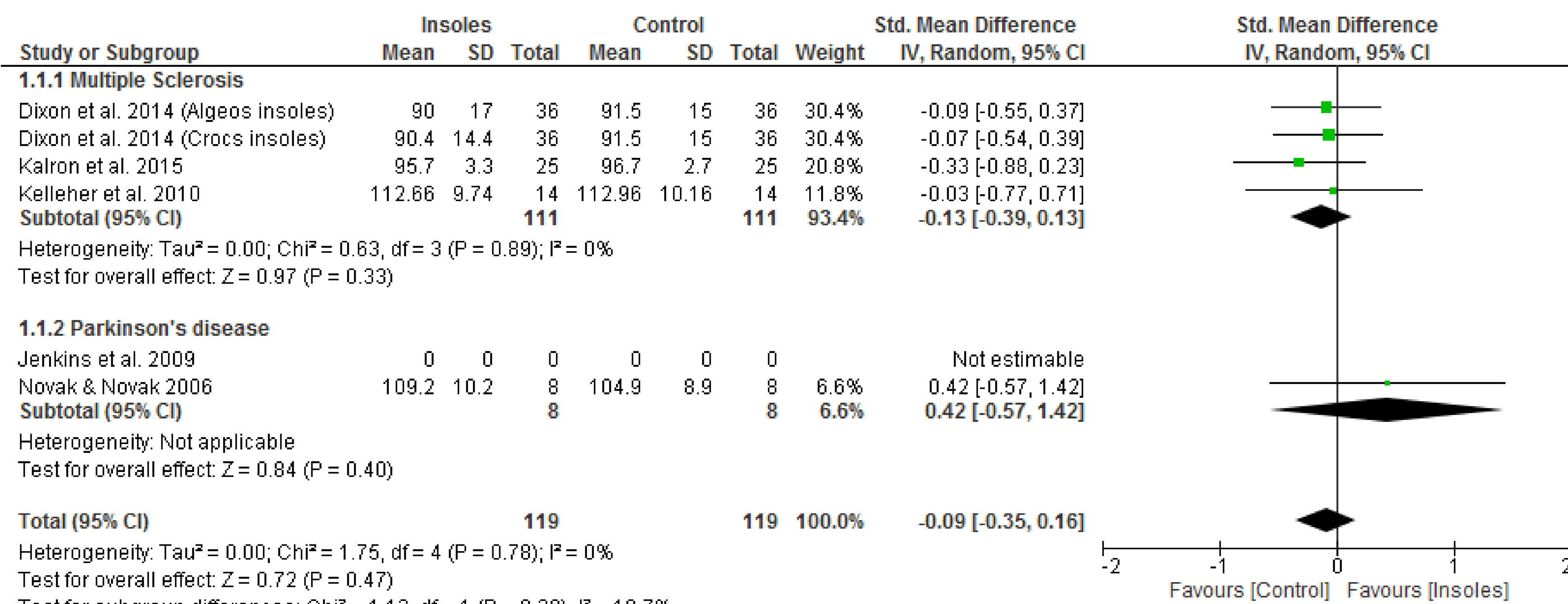


Fig. 1: Forest plot of the effect of textured or other types of stimulating insoles on the cadence (steps/minute), pooling data from 3 studies (in one study the outcome was analyzed for two insole conditions) including patients with multiple sclerosis, demonstrating data from one study including patients with Parkinson's disease (the effect from Jenkins et al. (2009) was not estimable, because cadence was not presented there) and pooling data from all evaluable studies. The subtotal effects for the subgroups multiple sclerosis and Parkinson's disease and the total effect were presented as a standard mean difference (95% CI). SD standard deviation, Std. standard, IV inverse variance, CI confidence interval.