

# Effects of neuromuscular gait modification strategies on indicators of medial knee joint load in people with medial knee osteoarthritis: Systematic review and a meta-analysis



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## Research question

- What are the effects of neuromuscular gait modifications on indicators\* of medial knee joint load in people with medial knee osteoarthritis?

(\*Definitions are in box 1)

Box 1: Medial knee joint load indicators included:

Knee adduction Moment (KAM) and Knee Flexion Moment (KFM), which were further divided into KAM1, KAM impulse, KAM2, KFM1, KFM2 (Definitions are given below)

KAM1: early stance peak KAM, KAM2: late stance peak KAM, KAM impulse: integration of the KAM over stance time, KFM1: early stance peak KFM, KFM2: late stance peak KFM

## Method

- Study design:** Systematic review and a Meta-analysis
- Databases:** Embase, MEDLINE, Cochrane, CINAHL, PubMed
- Eligibility:** Studies of gait interventions aimed at reducing medial knee joint load for adults with medial knee OA were included. Studies of gait aids or orthoses were excluded.
- Risk of bias of studies:** Downs and Black scale (Downs and Black, 1998)
- Data analysis:** Quality-adjusted meta-analysis models
- Certainty-evidence:** GRADE approach (Schünemann, 2013)

## Results

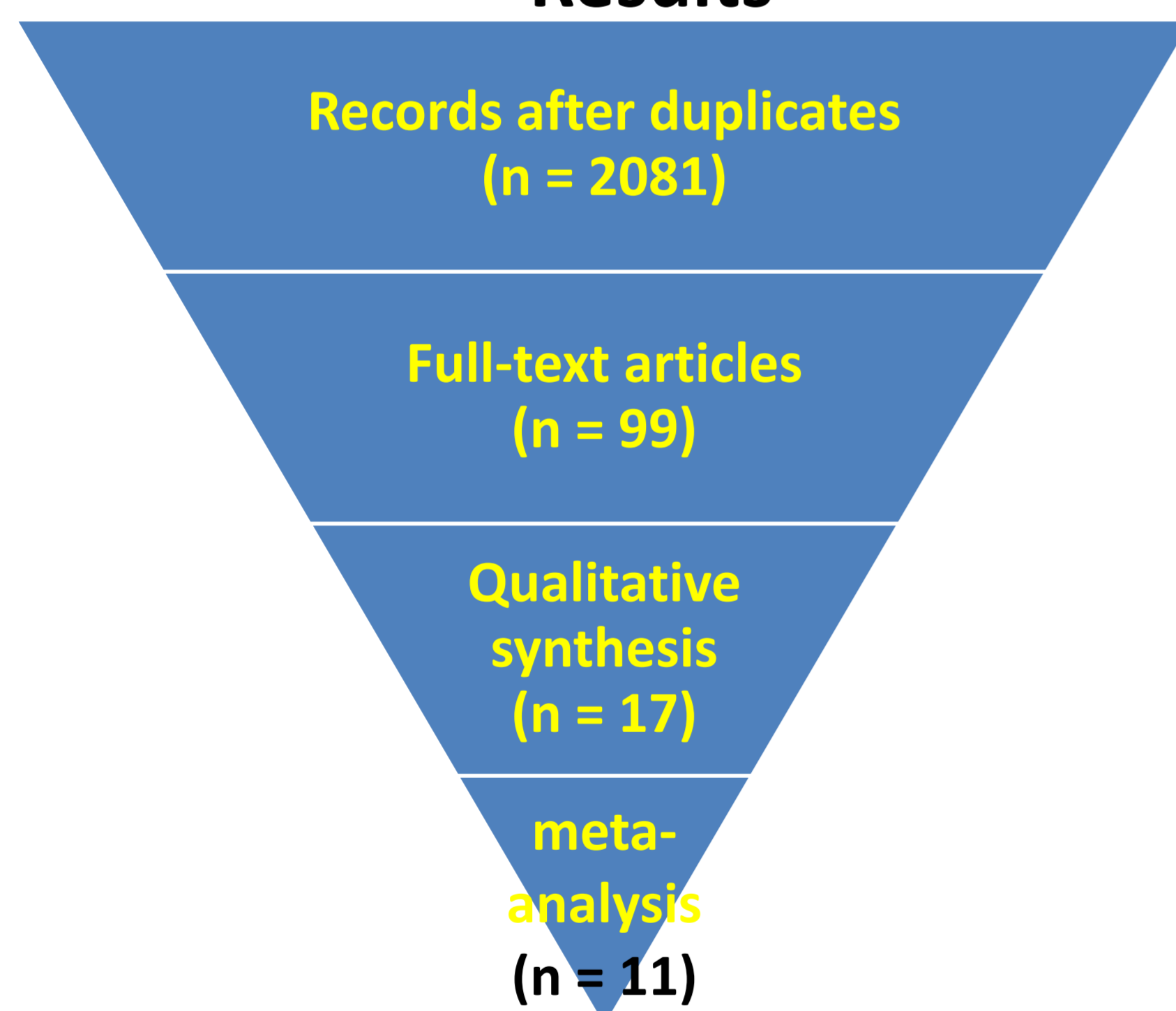


Figure 1: Study selection

- Included studies:** k= 17, pooled sample (n=362)

### Gait modifications included:

Ipsilateral trunk lean (k=4, n=73), toe-out (k=6, n=104), toe-in (k=5, n=89), medial knee thrust (k=3, n=61), medial weight transfer at the foot (k=1, n=10), wider steps (k=1, n=15), KAM feedback (k=3, n=84)

- Meta-analyses done:** for ipsilateral trunk lean, toe-out and toe-in
- Meta-analyses were not possible** for medial knee thrust, medial weight transfer at the foot, wider steps and specific KAM feedback due to insufficient studies for data pooling (but Individual studies demonstrated reduce knee joint load).



Ipsilateral trunk lean



Figure 2: Effect of ipsilateral trunk lean on KAM1

## Results

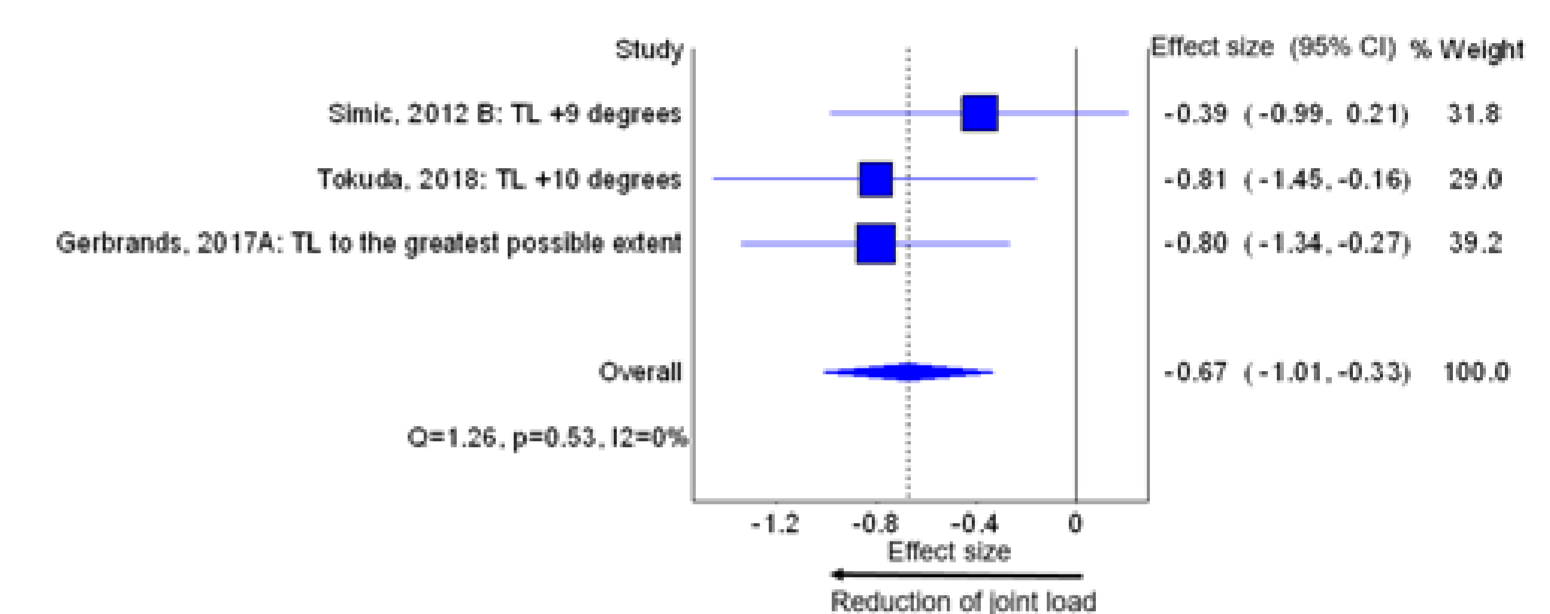


Figure 2: Effect of ipsilateral trunk lean on KAM1

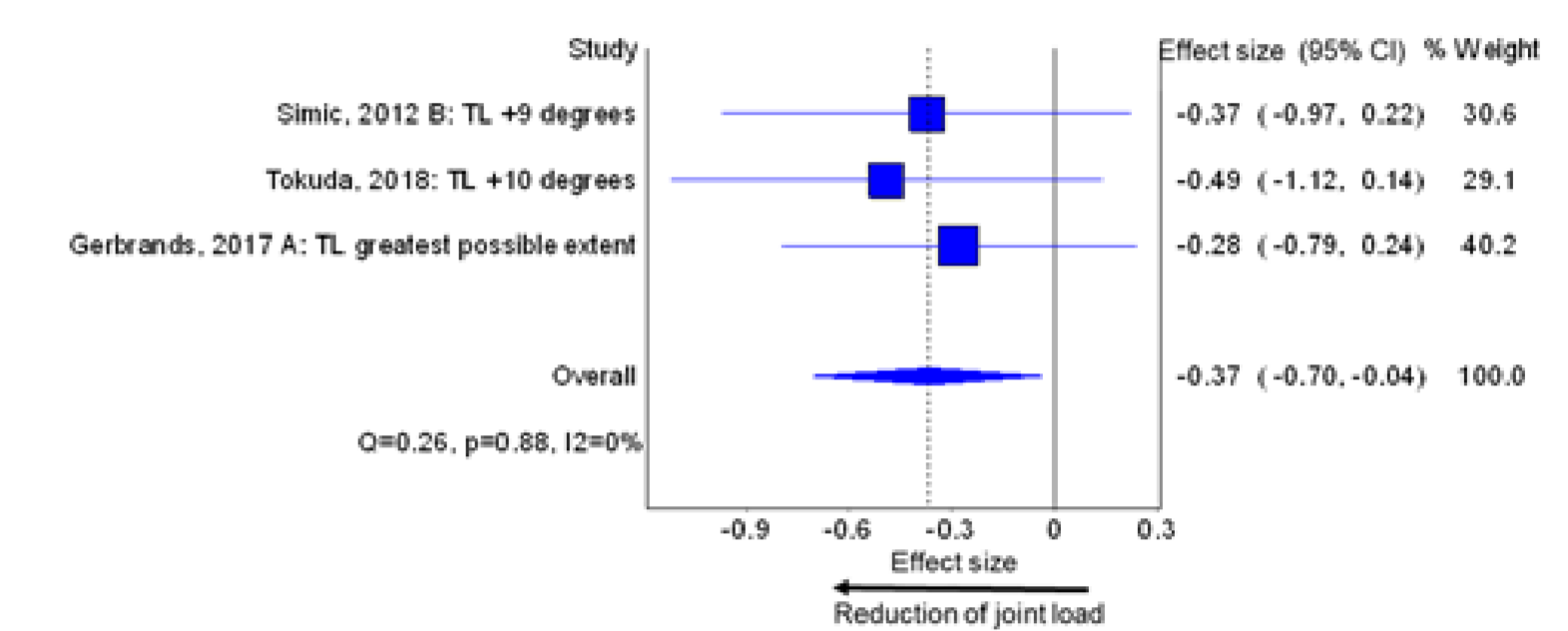


Figure 3: Effect of ipsilateral trunk lean on KAM impulse

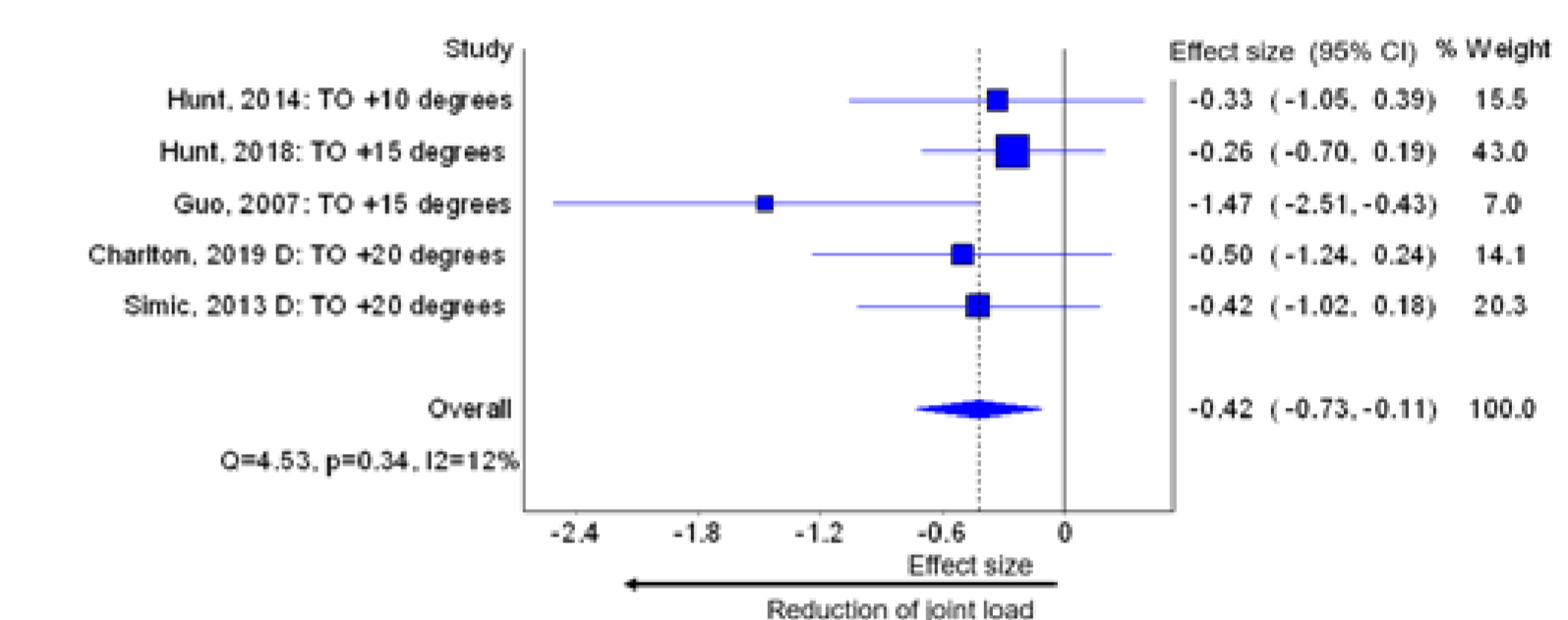


Figure 4: Effect of toe-out on KAM2

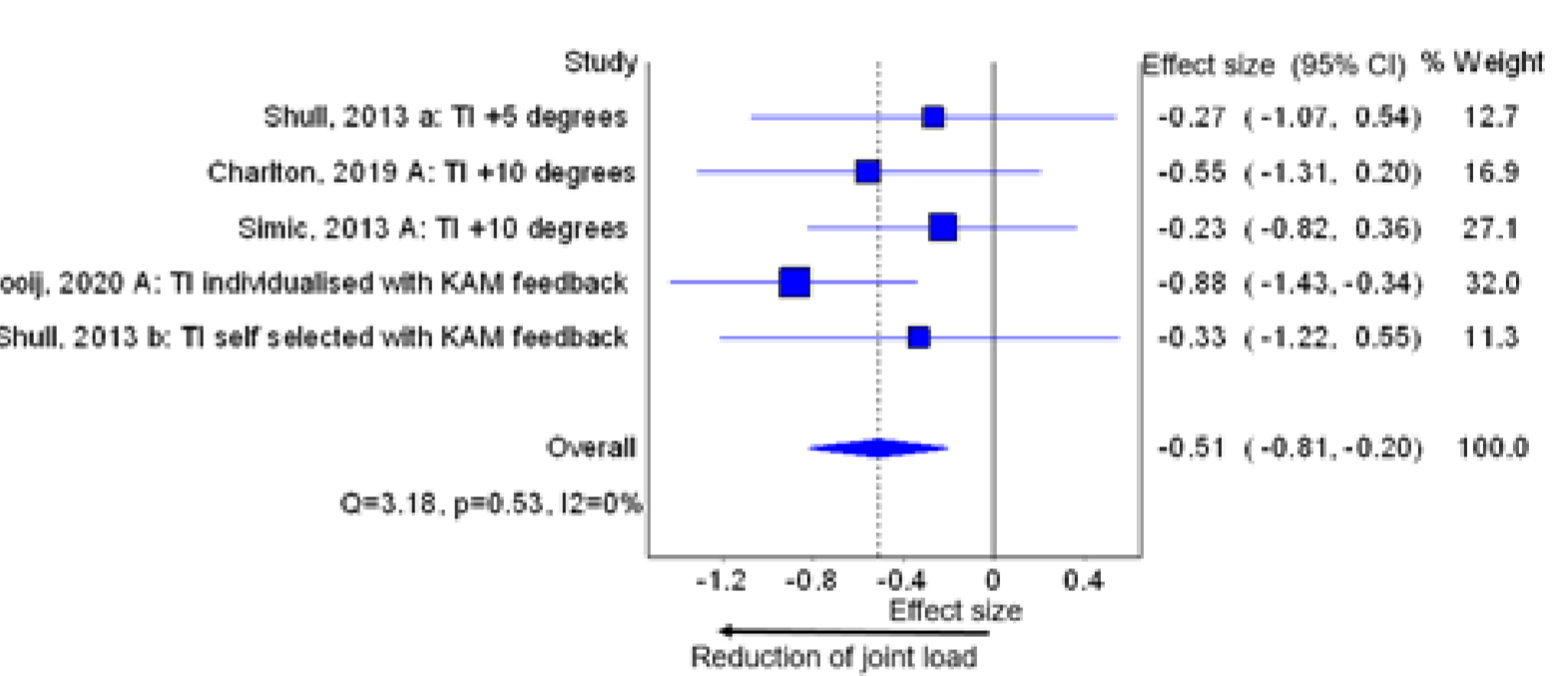


Figure 5: Effect of toe-in on KAM1

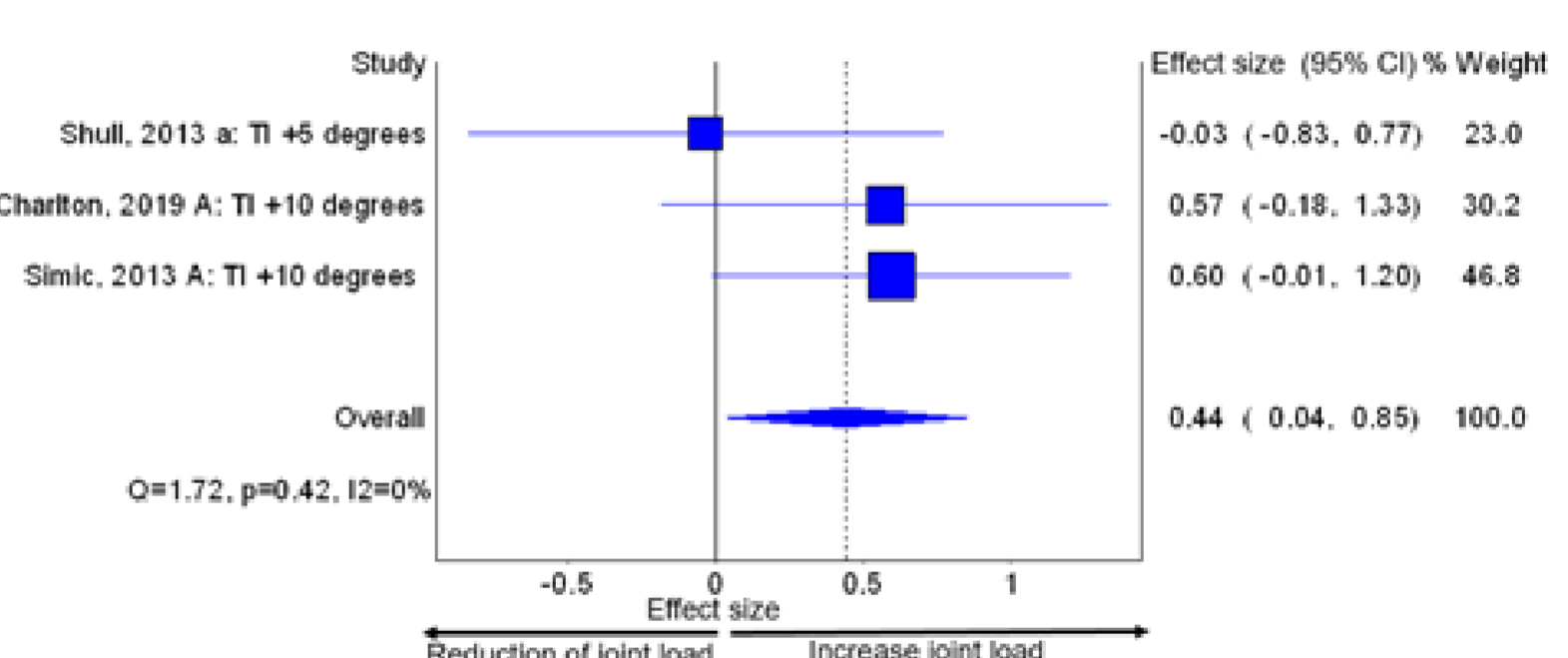


Figure 6: Effect of toe-in on KAM2

Table 1: Summary of results

Walking modification	Outcomes	Overall effects	Dose-response	Evidence certainty (GRADE)
Trunk lean	KAM1 reduction	medium	Yes	LOW
	KAM impulse reduction	small	No	VERY LOW
Toe-out	KAM2 reduction	small	No	VERY LOW
Toe-in	KAM1 reduction	medium	No	VERY LOW
	KAM2 increase	small	Yes	LOW

## Discussion

- Feedback included visual, verbal and haptic feedback.
- No adverse events were reported and there was no evidence of increased joint load on the hip, ankle and spine by gait modifications.
- Participants achieved peak trunk lean of 12°, toe-out of 20°, and toe-in of 10°.
- However, these findings are based on short-term effects.

## Conclusion

- Ipsilateral trunk lean, toe-out and toe-in all reduce medial knee joint load.
- To develop clinical recommendations, we need to know the best intervention, the best angle for trunk lean and toe out.
- Future studies need to use stronger research designs, evaluate longer-term programs and how many degrees produce an optimal effect.

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For references,  
scan the QR code

