Flat Feet in Young Children

Summary of evidence review (25-5-18)

Literature review

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Guidance for APCP Publication reviews

PRODUCING A NEW OR REVIEWING AN EXISTING PUBLICATION

The steps in creating or reviewing a publication are so similar they are outlined together in this document. Firstly a topic must be clearly defined and based on a clinical need for a publication. Secondly a working party with the relevant expertise must be formed. Thirdly the information gathering stage including thorough literature searches must be performed. Fourthly the evidence must be critically appraised. Finally the publication can be written/ reviewed based on the evidence available. Below, each of these steps has been expanded to ensure a standardised process is followed.

STEP 1: DEFINE A TOPIC (write on line below)

_____

1. Has the disorder to which these guidelines refer been clearly defined? Y

2. Has the level or levels of severity of the disorder to which these guidelines refer been clearly defined? Y

3. Has the age range of the child or children to which these guidelines refer been clearly defined? Y

4. Is there a clinical need to have a guideline on this population/ will it be transferrable to similar children in the UK? Y

If all of these answers are YES – proceed to Step 2

STEP 2: CREATE A WORKING GROUP

A working group should be kept small – a maximum of 3-4 people is recommended.

- 1-2 clinical expert(s) in the field (who has at least 5 years of clinical experience with this population or has done formal research of the population)
- 1 skilled researcher/ proficient in literature searches and analysing the literature
- 1 APCP member keen to learn the skills involved in creating publications

Members of the group: 1: Jane Simmonds 3: Charlotte Hookings

2: Rachel Evans

STEP 3: INFORMATION GATHERING/ FINDING THE EVIDENCE

1. Did the developers carry out a comprehensive, reproducible literature review within the past 12 months? No

2. Were appropriate search terms used? Consider alternative words relevant to the search topic (ie/ adolescent, young person, teenager)

Not stated

P – (patient/ problem/ population)	
I – Intervention	

C – (comparison/ control)	
O – (outcome)	

3. Was the search strategy appropriate? Not stated
   (Refer to http://www.cebm.net/searching-exercise-warm/ for assistance)

Question part	Question term	Synonyms	
Population	(	OR	) AND
Intervention or indicator	(	OR	) AND
Comparator	(	OR	) AND
Outcome	(	OR	) AND

NOTE: **'*'** is a truncation symbol that means further letters can be added (*child** rather than *children)*
OR finds studies containing either of the specified words/phrases, and broadens your search
AND finds studies containing both specified words/phrases, and narrows your search

Before you search, you should do three things:

- Underline the key terms – those most specific to your question
- Number the PICO elements in order of importance from 1-4
- Think of alternate spellings, synonyms and truncations

http://www.cebm.net/finding-the-evidence/

Jane Simmonds : Search undertaken April 2018

Flat Feet Leaflet APCP

Search Strategy

Terms: Pesplanus, Pes planus, Planovalgus, flat feet, low arch, orthoses, insoles, shoe inserts, treatment, non surgical, physical theraoy, physiotherapy, exercise _, non-surgical, management and efficacy, toddler, child, adolescent, juvenile

The search was limited to humans, English language, publication year from
20 onwards, and age (0±18 years)

Data bases: PubMed, AMED, Ovid Medline, Cinhal, PEDro, Cochrane Central Register, NICE

Dates: 2012 – 2018

Study designs

Systematic reviews, randomised controlled trials (RCTs), clinical control trials (CCTs)

PICO
Population

Inclusion: children (aged 0 ± 18 years) of either gender, diagnosed with flexible pes planus, irrespective of the diagnostic criteria used.

Exclusion: if participants had any history of injury or surgery of the lower limbs or conditions affecting lower limbs including infectious or systemic conditions, muscular, neurological or osseous abnormalities.

Intervention

Studies were included if the intervention was any type of foot orthoses

Comparator

No intervention or shoes, physical therapy, physiotherapy, exercise

Outcome

620 studies were identified and pooled. Duplicates were removed. 542 articles were screened for titles and abstracts. Eighteen studies were reviewed and 6 successfully met the eligibility criteria.

Reference list for review

- Aboutorabi A, Saeedi H, Kamali M, Farahmand B, Eshraghi A, Dolagh RS.2014. Immediate effect of orthopedic shoe and functional foot orthosis on center of pressure displacement and gait parameters in juvenile flexible flat foot. Prosthetics and Orthotics International. 38(3):218-23
- Asgaonkar B, Kadam P. 2012. Effectiveness of valgus insole on pain, gait parameters and physiological cost index of walking in flat feet in 5±15 years. Indian Journal of Physiotherapy and Occupational Therapy- An International Journal.; 6(2):85-9
- Dars S, Uden H, Banwell H et al .2018. The effectiveness of non-surgical intervention (Foot Orthoses) for paediatric flexible pes planus: A systematic review: Update. Plos One PloS ONE 13(2): e0193060. https://doi.org/10.1371/journal.pone.0193060
- MacKenzie A, Rome K, Evan A 2012. The Efficacy of Nonsurgical Interventions for Pediatric. Flexible Flat Foot: A Critical Review. Pediatr Orthop. 32, 8, 830 - 834
- Pandey S, Pal CP, Kumar D, Singh P. 2013. Flatfoot in Indian population. Journal of orthopaedic surgery; 21(1):32-6
- Sinha S, Song HR, Kim HJ, Park MS, Yoon YC, Song SH. 2013. Medial arch orthosis for paediatric flatfoot. Journal of orthopaedic surgery; 21(1):37-43
- Uden et al. 2017. Review of flat feet – what is normal. Journal of Foot and Ankle Research. J of foot and ankle surgery 10:37

Noted Evan 2010 Cochrane review – used previously in leaflet

Articles

Reviewer	RE	JS	RE	JS
Article number:	1. Aboutorabi et al.2014	1.Aboutorabi A et al. 2014	2.Asgaonkar & Kadam P. 2012.	2. Asgaonkar & Kadam P. 2012.

Level of evidence	2 RCT	2 RCT	2 RCT	2 RCT
P – (patient/ problem/ population) I – Intervention C – (comparison/ control) O – (outcome)	P: 50 children average age 7.76yrs +/- 1.4 yrs (30 with flat feet, 20 control) I: 3 treatment groups: medical shoe, functional foot orthosis, bare foot C: 20 children in control – no flat feet. O: effect on centre of pressure (CoP) displacement, gait symmetry and walking speed	P: 50 children average age 7.76yrs +/- 1.4 yrs (30 with flat feet, 20 control) I: 3 treatment groups: medical shoe, functional foot orthosis, bare foot C: 20 children in control – no flat feet. O: effect on centre of pressure (CoP) displacement, gait symmetry and walking speed	P: 30 children age 5-15yrs with flexible flat feet I: valgus insole C: none O: effect on pain, gait parameters and physiological cost index of walking	P: 30 children age 5-15yrs with flexible flat feet I: valgus insole C: none O: effect on pain, gait parameters and physiological cost index of walking
Internal validity				
1a (randomised?)	Y	Yes	Y	Yes
1b (groups similar – p value?)	Mean and SD values for age, height, weight and BMI between flat feet and control very similar. Children matched for height and weight.	Yes	Y	Yes
2a groups treated equally?	Y	Yes	Y	Yes
2b	No drop out	No drop out	25% drop out	25% drop out
3 blinding and outcome measures?	Test order randomised for each child to minimise learning effect No blinding documented	Random testing Blinding not documented OCM Gait – SL, SW, Sym, SV	Objective measures used but not able to be blinded due to nature of study Outcome measures:	No obj measures OCM – pain BAS Cots of walking PCI Gait – SL, cad and vel

	Outcome measures: Gait parameters: step length, step width, step length symmetry, step velocity, And CoP displacement	Centre of Pressure	- Mean Pain (visual analogue scale), - Physiological cost index of walking (PCI) gait parameters (Step length, Stride length, Cadence, Walking velocity)	
Results				
1 outcome measures	**CoP** comparing flat feet and control Barefoot (BF): P= 0.002 (significant) Regular shoe with orthosis (RSO): P=0.021 (significant) Medical shoe (MS): P=0.085 (not significant) **Gait parameters comparing flat feet and control** Step length BF: 0.001 (significant) RSO: 0.013 (significant) MS: 0.197 (not significant) Step width BF: 0.071 (not significant) RSO: 0.076 (not significant) Step length symmetry BF: 0.000 (significant) RSO: 0.000 (significant) MS: Step velocity BF: 0.000 (significant) RSO: 0.000 (significant) Step velocity	CoP vs control BF – .002 sig (no CI) Regular shoe with orthosis (RSO): P=0.021 (sig) Medical shoe (MS): P=0.085 (not sig) Mixed report on gait parameters	Confidence interval and student 't' test A p value of <0.05 was considered statistically significant. **change in pain** - experimental group: confidence interval -2.87 + 2.25 control 0.82 + 1.52. P= 0.00000 (significant) **Change in PCI**: experimental group: confidence interval -0.07 + 0.16 control 0.05 + 0.14 P= 0.0031 (significant) <u>Gait parameters:</u> **Change in mean cadence**: confidence interval experimental group -3.93 + 12.30 control 0.30 + 11.11 P= 0.235 (not significant) **Change in mean step length**: confidence interval experimental group 2.89 + 9.83 control -0.77 + 8.92 P= 0.385 (not significant)	CI 0.05 set as alpha **change in pain** - experimental group: confidence interval -2.87 + 2.25 control 0.82 + 1.52. P= 0.00000 (sig) **Change in PCI**: experimental group: confidence interval -0.07 + 0.16 control 0.05 + 0.14 P= 0.0031 (sig) Gait parametres – no sig

	BF: 0.000 (significant) RSO: 0.000 (significant) MS: 0.190 (not significant)		**Changes in mean stride length**; confidence interval experimental group 5.02 + 17.04 control -1.98 + 19.79 P= 0.526 (not significant) **Changes in mean velocity**: confidence interval experimental group 0.02 + 0.11 control -0.02 + 0.13 P= 1.000 (not significant)	
2				
Applicability to flat feet leaflet	Not specific to 'young children' Functional foot orthosis can improve gait parameters and CoP displacement in children with moderate flat feet compared to medical shoe	Leaflet is specific to young children however this study was over 8's. Suggests that specified treatment is effective for symptomatic flat feet in older children and adults, but needs better statistical analysis.	Yes – suggests that use of valgus insoles can improve pain and PCI for children with flexible flat feet, however study not specific to young children (5-15yrs)	Not specific to 'young children' (Mean 8 years). Results of foot angles were very mixed. Pain in midfoot and forefoot were significantly improved with medial arch support.

Continued

Article number:	5.Pandey et al. 2013	5. Pandey et al. 2013	6 Sinha et al 2013	6. Sinha et al 2013
Level of evidence	2 RCT	2 (poor) RCT	2 RCT	2 RCT (better)
P – (patient/ problem/ population) I – Intervention	P: 200 people (150 with symptomatic flat feet, 50 control) aged over 8 years I: 4 treatment groups: (1) foot exercises (n=60), (2) use of the Thomas crooked and elongated heel with or without arch support (n=45),	Agree 200 people 150 people aged 8 + randomized into 4 interventions Exercises, TC heel, RS insoles, Foot exercises and foot wear modifications	P: 81 children aged 36-204 months with bilat symptomatic flat feet I: medial arch support C: control group received analgesics O: Foot angles and AOFAS hindfoot scores using radiographs and computer software to measure angles.	Agree

C – (comparison/ control) O – (outcome)	(3) use of the Rose Schwartz insoles (n=18) (4) foot exercises combined with both footwear modifications (n=27). C: 50 children with no flat foot or lower limb deformity. O: how good The great toe extension test is as a screening tool, how good the foot print index (FPI) is as a diagnosing tool and for evaluating treatment progress, the effect of foot exercises and footwear modifications on pain and heel deformity in people with symptomatic flat feet.			
Internal validity				
1a (randomised?)	Y		Y - randomisation process not specified	Agree – no detail
1b (groups similar – p value?)	Not documented		Documented that 2 groups were comparable in term so f age and sex but no p value. Follow up period was significantly shorter in treatment group rather than control group p=0.003 as follow up was extended if treatment responses were equivocal.	Agree with the analysis
2a groups treated equally?	Not documented	Unequally randomised for treatment	Follow up period was significantly shorter in treatment group rather than control group p=0.003 as follow up was extended if treatment responses were equivocal.	
2b	No drop out	Agree	19% drop out but includes unspecified number excluded due to other medical factors	Agree
3 blinding and outcome measures?	Objective measures Pain (specific measure not specified) Valgus index Foot print index gait improvement (in terms of less wear on the medial than lateral part of their shoes)	Pain – no pain OCM mentioned. Blind analysis repoted	Observers were blinded to the treatment allocation. Foot angles (AP, TC, TFM, calcaneal pitch angle, TN) scores using radiographs and computer software to measure angles and AOFAS pain scores in forefoot, midfoot and hindfoot	Agree
Results				
1 outcome measures	Improvements in mean figures for footwear and footwear plus exercises groups however no analysis of significance documented	Some improvements in pain with in all participants Footwear modifications/ Insoles and heels and exercises improvement in pain and footwear.	Changes between 2 groups pre and post intervention (P value): **TMF** Right: 0.357 (not significant) Left: 0.004 (significant) **Lateral TC**	

		Poor reporting, lack of inferential stats.	Right: <0.001 (significant) Left: <0.001 (significant) **Calcaneal pitch angle** Right: 0.087 (not significant) Left: 0.016 (significant) **AP TC** Right: 0.020 (significant) Left: 0.162 (not significant) **AP TN** Right: 0.565 (not significant) Left: 0.779 (not significant) **AP TFM** Right: 0.304 (not significant) Left: 0.279 (not significant) **AOFAS** Forefoot: 0.005 (significant) Midfoot: <0.001 (significant) Hindfoot: 0.074 (not significant) All differences in changes of foot angles and AOFAS scores between the 2 groups remained significant after adjusting for age, sex, and follow-up period using the ANCOVA	
2				
Applicability to flat feet leaflet	Leaflet is specific to young children however this study was over 8's. Suggests that specified treatment is effective for symptomatic flat feet in older children and adults, but needs better statistical analysis.	This study is 8 + not young people. The study provides some, not very strong evidence for insoles/ modifications and exercise. Needs a better study with stats and on younger children.	Not specific to 'young children' (Mean 8 years). Results of foot angles were very mixed. Pain in midfoot and forefoot were significantly improved with medial arch support.	Not for very young children. Improvements in pain in mid and forefoot with medical arch support

Systematic reviews

Reviewers	RE	JS	RE	JS	RE	JS
Article	3. Dars et al 2018	3. Dars et al 2018	4. Mackenzie et al 2012	4. Mackenzie et al 2012	7. Udan et al 2017	7. Udan et al 2017
Level of evidence	Systematic review with many designs	Wide review RCT, CT, CS Level 4 (poor)	?? A Critical Review	Systematic review (Not RCTs) with critical/	??A systematic review	Systematic review

				narrative discussion		
Clear question?	Y – What is the current evidence base for the effectiveness of FOs for paediatric flexible pes planus.	Agree	Evaluate the effect of foot orthosis for Pediatric Flexible Flat Foot:	Agree	The typically developing paediatric foot: how flat should it be?	How flat should a paediatric foot be? Typical development
Could relevant studies have been missed?	Conducted using PRISMA MESH headings used but limited to English language Secondary search of reference sections done	Agree	Electronic databases searched. MESH headings used but limited to English language Secondary search of reference sections done	Agree – wide and appropriate database search	Unlikely - Electronic databases searched. MESH headings used Secondary search of reference sections done	Very rigorous search
Appropriate inclusion criteria?	Y - Eligibility criteria used using PICO	Agree	Y - Peer reviewed journal articles	Yes agree	Y - Quantitative design, in peer reviewed journal, outcome measure used for whole population and mean and SD data reported	Yes - agree
Were included studies valid? Assessed using criteria?	McMaster Critical Review Form for Quantitative Studies and Intervention category of the Australian National Health and Medical	Agree	Quality index used to evaluate the research quality of articles - assessed articles as generally poor	Yes agree QI used Generally poor – no control	PRISMA protocol used to compare data. The Australian National Health and Medical Research	Yes agree

	Research Council's (NHMRC) evidence hierarchy was used. Data extracted: study and participants' characteristics, interventions, comparators and outcomes. Additional data extracted included study's protocol, diagnostic measures used for pes planus, measures of outcomes and adverse outcomes				Centre designation of levels of evidence – Aetiology research question; was used to allocate the methodological design of the included studies. The Epidemiological Appraisal Instrument (EAI) was used to assess the risk of bias of the included studies	
Results similar between studies?	Due to the heterogeneity of the included studies, a meta-analysis was not conducted. Instead a descriptive synthesis / narrative discussion of the results was undertaken.	Agree	Due to the heterogeneity of the included studies, a meta-analysis was not conducted. Instead a descriptive synthesis of the results was undertaken.	Agree – narrative undertaken		
Results presented well?	Y – children included were aged 7-15 years	Agree	Y – but limited due to diversity	Yes	Y - means and confidence intervals recorded	Yes – thorough with CI

			of results methods			
Applicability to flat feet leaflet	No young children included in studies. Since different types of orthosis used in studies no definitive conclusion on treatment but suggests that foot orthoses may have a positive impact in flexible flat feet in older paed population NB 4 of above articles reviewed by myself included in this	Agree	Very limited evidence for this research question – poor quality studies only. No conclusion could be drawn. Age: 7months – 14 years	Agree In 2012 limited evidence/ poor evidence to support use of orthotics for FFF	Foot posture is age dependent and shown to change over time, no firm conclusion reached on when this change stops	Agree. Foot posture changes with age. ++ heterogeneity. Needs to be more consistent in terms of measures
Older children relevance		Consistent evidence to indicate that FOs have + impact in reducing pain. FOs may also have a consistent role to play in improving foot posture, gait and function. Suggesion that FO improve anatomical development				

Articles as numbered above

1. Aboutorabi A, Saeedi H, Kamali M, Farahmand B, Eshraghi A, Dolagh RS.2014. Immediate effect of orthopedic shoe and functional foot orthosis on center of pressure displacement and gait parameters in juvenile flexible flat foot. Prosthetics and Orthotics International. 38(3):218-23
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3. Dars S, Uden H, Banwell H et al .2018. The effectiveness of non-surgical intervention (Foot Orthoses) for paediatric flexible pes planus: A systematic review: Update. Plos One PloS ONE 13(2): e0193060. https://doi.org/10.1371/journal.pone.0193060
4. MacKenzie A, Rome K, Evan A 2012. The Efficacy of Nonsurgical Interventions for Pediatric. Flexible Flat Foot: A Critical Review. Pediatr Orthop. 32, 8, 830 - 834
5. Pandey S, Pal CP, Kumar D, Singh P. 2013. Flatfoot in Indian population. Journal of orthopaedic surgery; 21(1):32-6
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7. Uden et al. 2017. Review of flat feet – what is normal. Journal of Foot and Ankle Research. J of foot and ankle surgery 10:37

8. The P.I.C.O. Model for Clinical Questions

P	**P**atient, **P**opulation, or **P**roblem	How would I describe a group of patients similar to mine?
I	**I**ntervention, Prognostic Factor, or Exposure	Which main intervention, prognostic factor, or exposure am I considering?
C	**C**omparison or Intervention (if appropriate)	What is the main alternative to compare with the intervention?

O	**O**utcome you would like to measure or achieve	What can I hope to accomplish, measure, improve, or affect?
	What **T**ype of question are you asking?	Diagnosis, Etiology/Harm, Therapy, Prognosis, Prevention
	Type of **S**tudy you want to find	What would be the best study design/methodology?