

# Nonsurgical Treatments for Idiopathic Clubfoot: A Comparison of the Ponseti and French Physiotherapy Methods

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**Clinical Question:** For children with idiopathic clubfoot does the Ponseti Method or French Physiotherapy Method produce superior results in regards to foot alignment, normalized gait, and reducing the need for surgical correction?

**Background:** Idiopathic talipes equinovarus, or clubfoot, is a common congenital condition that affects up to 200,000 children each year<sup>1,2</sup>. It is characterized by complex varus and adduction deformities in one or both feet, and can be rigid or flexible in nature<sup>3</sup>. The Diméglio scale is a common classification system used to determine the severity of the deformity based on resistance to manual correction. The scale ranges from 1-20 with grades of I – IV; Grade I is benign (scores 1-5), Grade II is moderate (scores 5-10), Grade III is severe (scores 10-15), and Grade IV is very severe (scores 15-20)<sup>4</sup>. Left untreated, clubfoot will cause pain, discomfort, and severe walking challenges<sup>1,2</sup>. Non-surgical treatments have been widely accepted and begin immediate or shortly after birth. Two non-surgical clubfoot treatments are the Ponseti Method (PM) developed by Dr. Ignacio Ponseti in the United States in the 1960s and the French Physiotherapy Method (FM) developed by Dr. Paul Masse, Henri Bensahel, and orthopaedic surgeons in France during the 1970s<sup>5,6</sup>. PM includes soft tissue manipulation and a series of weekly long leg casts, a percutaneous Achilles tenotomy, followed by the use of specialized boots and an abduction bar until the child is of walking age<sup>7,8</sup>. FM includes daily physical therapy for stretching and manipulation and immobilization with corrective tape and splints to maintain correction<sup>7,8</sup>. This critically appraised topic was conducted to compare the efficacy of these treatment methods.

## Search Strategy:

**Databases Searched:** Google Scholar, PubMed, oandp.org

**Search Terms:** (clubfoot OR talipes equinovarus OR idiopathic clubfoot) AND (Ponseti OR Ponseti method) AND (French method OR French physiotherapy OR French functional method OR French physical therapy and taping)

**Inclusion/Exclusion Criteria:** 2000-present, English

**Synthesis of Results:** Six studies<sup>8-13</sup> compared the results of PM with FM on idiopathic clubfoot in a total of 642 children (range 33 – 256) over a minimum 2 year follow up period. All but two studies<sup>9,12</sup> were prospective, non-randomized cohort studies. One study<sup>10</sup> found initial correction for PM to be 94.4% and FM to be 95%. Rates of relapse ranged from 22%-37% in PM and 17%-29% in FM, but the FM group had higher incidence of post-treatment surgical correction<sup>8-10,12</sup>. One study showed all relapsed FM feet required surgical correction while most relapsed PM feet avoided corrective surgery through additional serial casts of crossover treatment<sup>10</sup>. The Achilles tenotomy in PM protocol was not counted as surgical correction. Gait analysis showed that both groups had residual in-toeing and a more lateral center of pressure compared to age matched controls, but no difference in walking speed, cadence, or stride length<sup>8,11</sup>. The most common PM gait deviations were increased stance phase ankle dorsiflexion and calcaneal gait<sup>8,11</sup>. FM gait deviations included knee hyperextension, foot drop, and equinus gait<sup>8</sup>. Initial Diméglio scores tend to correlate with treatment outcomes; lower scoring feet generally had better post-treatment results than higher rated feet and the higher rated feet responded better to PM treatment<sup>10,12</sup>. Several studies suggested that regular Achilles tenotomy in the PM protocol may be a factor leading to differences in post-treatment outcomes<sup>8,10</sup>. Limitations of these studies included non-randomization<sup>8-13</sup>, self-reported compliance<sup>9,10</sup>, and gait variation due to the young age of the study participants<sup>11,13</sup>.

**Clinical Message:** Overall, the results indicate that initial correction is nearly the same for both PM and FM treatment, those treated with PM have fewer gait deviations, and feet with higher (e.g. worse) initial Diméglio scores respond better to PM. Rates of relapse tend to be higher for PM, but those treated with FM are more likely to undergo post-treatment surgical correction (surgical intervention other than an Achilles tendon release

or lengthening). Future studies should focus on the effect that Achilles tenotomy has on successful treatment in both methods and the success of cross-over treatment.

**Evidence Table**

	<b>Richards et al., 2008<sup>10</sup></b>	<b>Jeans et al., 2010<sup>11</sup></b>	<b>Chotel et al., 2011<sup>12</sup></b>	<b>Gottschalk et al., 2010<sup>13</sup></b>	<b>El Hawray et al., 2008<sup>8</sup></b>	<b>He et al., 2017<sup>9</sup></b>
<b>Purpose or Hypothesis</b>	<p>To compare PM and FM in regards to initial correction, rate of relapse, and clinical outcomes.</p> <p>Secondary: To determine if initial Diméglio score is related to clinical outcomes at a 2 year follow up time.</p>	<p>To compare the plantar pressures during gait of children treated for idiopathic clubfoot with PM or FM to controls.</p> <p>Secondary: To determine if radiograph findings are related to pedobarograph analysis.</p>	<p>To compare patients treated with PM and FM in two different institutions.</p>	<p>To compare the gait of children with idiopathic clubfoot treated with PM or FM whose initial Diméglio score was moderate.</p>	<p>To compare the gait characteristics of 2 year-olds with idiopathic clubfoot treated with PM or FM.</p>	<p>To determine the effectiveness of non-surgical treatments for idiopathic clubfoot.</p>
<b>Population</b>	<p>n = 256</p> <p>PM: 176 FM: 80</p> <p>Average age at initial treatment: under 3 months old.</p>	<p>n = 205 final analysis = 102*</p> <p>PM: 56 FM: 46 Controls: 17</p> <p>Average age at initial treatment: under 3 months old.</p> <p>Average age at gait analysis: approximately 2 years old.</p>	<p>n = 146</p> <p>PM: 69 FM: 77</p> <p>Average age at referral: under 1 month old.</p>	<p>n = 35 final analysis = 33</p> <p>PM: 15 FM: 18 Controls: 15</p> <p>Average age at gait analysis: approximately 2 years old.</p>	<p>n = 182 final analysis = 105</p> <p>PM: 56 FM: 49 Controls: 15</p> <p>Average age at gait analysis: approximately 2 years old.</p>	<p>9 studies identified for meta-analysis</p> <p>Total n across studies = 1435</p> <p>Average age at initial treatment: not stated</p>
<b>Inclusion/Exclusion Criteria</b>	<p>Children with idiopathic clubfoot under 3 mo old who had not received previous treatment.</p>	<p>Children with idiopathic clubfoot treated between February 1998 and May 2004 with an initial Diméglio score of moderate to very severe.</p>	<p>Children with idiopathic clubfoot and an initial Diméglio score of 1, no older than 1 mo at referral, no prior treatment.</p>	<p>Children with idiopathic clubfoot with an initial Diméglio score of moderate (between 6 and 10).</p>	<p>Children with idiopathic clubfoot treated between February 1998 and May 2004 at Texas Scottish Rite Hospital with an initial Diméglio score of severe or very severe.</p>	<p>Studies published in English making a comparison between PM and at least one other non-surgical treatment method for idiopathic clubfoot.</p>

Study Design	Prospective, non-randomized cohort study	Prospective, non-randomized cohort study	Retrospective, non-randomized cohort study	Prospective, non-randomized cohort study	Prospective, non-randomized cohort study	Meta-analysis
Intervention	<p>PM</p> <p>Diméglio scores were assessed prior to treatment intervention.</p> <p>Feet were manipulated and casted by a physician until foot correction was achieved. After casting, the children used a Dennis Browne bar and straight-last shoes full time for 3 months with monthly follow up visits then transitioned to nighttime use of the abduction orthosis until the age of 2 with follow up visits every 3 months.</p>	<p>PM</p> <p>Diméglio scores were assessed prior to treatment intervention.</p> <p>Feet were treated according to the described protocols for the Ponseti Method and children had regular follow up with their orthopaedist.</p> <p>Standing lateral ankle radiographs were taken at 18 months old and gait analysis was performed at approximately 2 years old.</p>	<p>PM</p> <p>Feet were treated according to the Ponseti Method recommendations. Weekly casts were applied until foot correction was achieved. A percutaneous heel-cord tenotomy was performed on children who could not reach 15 degrees of dorsiflexion before the final cast was applied. After casting, the children used a Uni-Bar derotation splint full time for 4 months. The derotation splint was removed in the daytime for the following 5 months. The splint was used during periods of sleep until the children could walk and at night only until the children were 3 or 4 years old.</p>	<p>PM</p> <p>Diméglio scores were assessed prior to treatment intervention.</p> <p>Feet were treated according to the described protocols for the Ponseti Method. Feet were manipulated and casted by a physician. A percutaneous Achilles tenotomy was performed on select patients before the final cast was applied. After casting, the children used a foot abduction orthosis (not specified) full time for 3 months and during periods of sleep until the children were 3 or 4 years old.</p> <p>Gait analysis was performed at approximately 2 years old.</p>	<p>PM</p> <p>Diméglio scores were assessed prior to treatment intervention.</p> <p>Feet were treated according to the described protocols for the Ponseti Method. Feet were manipulated and casted by a physician. A percutaneous Achilles tenotomy was performed on select patients. After casting, the children used a foot abduction orthosis (not specified) full time for 3 months and during periods of sleep until the children were at least 2 years old.</p> <p>Gait analysis was performed at approximately 2 years old.</p>	<p>PM</p> <p>Details of treatment protocols were not specified due to this being a meta-analysis.</p>
Comparison	<p>FM</p> <p>Diméglio scores were assessed prior to treatment intervention.</p>	<p>FM</p> <p>Diméglio scores were assessed prior to treatment intervention.</p>	<p>FM</p> <p>Feet were manipulated, taped, and splinted 5 times per week by a physical therapist. The children used a</p>	<p>FM</p> <p>Diméglio scores were assessed prior to treatment intervention.</p>	<p>FM</p> <p>Diméglio scores were assessed prior to treatment intervention.</p>	<p>FM and other non-surgical interventions</p> <p>Details of treatment protocols were not specified due to this</p>

	Feet were manipulated, taped, and splinted daily by a physical therapist until foot correction was achieved. Follow up visits with the orthopaedist occurred every 3 months. After foot correction was achieved, families continued to tape the feet and use a splint.	Feet were treated according to the described protocols for the French Physiotherapy Method and children had regular follow up with their orthopaedist.  Standing lateral ankle radiographs were taken at 18 months old and gait analysis was performed at approximately 2 years old.	splint that positioned their knees in 90 degrees of flexion and feet in neutral until 6 months old. Between 6 months and 1 year the children used a daytime below knee splint and nighttime above knee splint. When the children could walk, only the nighttime above knee splint was used.	Feet were manipulated, taped, and splinted daily by a physical therapist until foot correction was achieved. After foot correction was achieved, families continued with a home program and had periodic follow up visits with the physical therapist.  Gait analysis was performed at approximately 2 years old.	Feet were manipulated, taped, and splinted 5 times per week by a physical therapist. The feet were immobilized using tape between sessions. After foot correction was achieved, families continued with a home program and had periodic follow up visits with the physical therapist until the children were 2 or 3 years old.  Gait analysis was performed at approximately 2 years old.	being a meta-analysis.
<b>Outcome Measures</b>	Diméglio score and rate of relapse	Diméglio Score and pedobarograph data	Diméglio score, rate of relapse, heel cord tenotomy, and need for surgical intervention	Diméglio score and gait analysis	Temporal gait patterns and gait parameters	Need for surgical intervention, alignment achieved, and rate of relapse
<b>Follow-up</b>	4.3 yr average (2 – 6.6 yr)	Gait analysis done when children were about 2 years old	5.5 year average (2.5 – 7.4 yrs)	Gait analysis done when children were 2 yr and 4 mo average (1 yr 11 mo – 3 yr 2 mo)	Gait analysis done when children turned 2 years old	N/A
<b>Key Findings</b>	Initial Correction: PM 94.4%, FM 95%.	Feet treated with PM and FM both had forefoot adductus and a more lateral COP as compared with controls.  FM feet had significantly less medial pressure than controls and less	Surgery required for 16% PM and 21% FM. The surgery rate for FM group decreased throughout the study.  Better results with PM, but not significant. This may	PM gait: increased stance phase DF (especially with Achilles tenotomy).  FM gait: equinus and foot drop.  Normal stance phase sagittal plane kinematics: PM 14	PM gait: increased stance phase DF (especially with Achilles tenotomy) and calcaneus gait.  FM gait: higher rates of knee hyperextension, foot drop, intoeing, equinus gait,	This analysis shows no significant difference between PM and FM regarding initial correction, rate of relapse, and need for surgical intervention.

		dorsiflexion range than PM group and decreased hindfoot pressure.	be due to the Achilles tenotomy.	<p>feet (82%) and FM 11 feet (48%).</p> <p>Normal gait: PM 6 feet (35%) and FM 6 feet (26%).</p>	<p>increased internal shank-based rotation, more normal sagittal gait kinematics.</p> <p>No difference between the groups regarding walking speed, cadence, and stride length. Achilles tenotomy may play a role in the sagittal plane differences between the groups.</p> <p>Post-treatment surgical incidence at the time of gait analysis: 23% PM and 36% FM.</p> <p>Normal sagittal plane kinematics: PM 37 feet (47%) and FM 49 feet (65%)</p> <p>Normal gait: PM 11 feet (14%) and FM 11 feet (15%).</p>	There was higher incidence of surgical intervention in non-PM groups.
<b>Additional Findings</b>	<p>Initial Diméglio scores tend to correlate with treatment outcome. Moderate rated feet had more favorable post-treatment results.</p> <p>Rates of relapse within 2 years post treatment: PM 37%, FM 29%.</p> <p>Parent non-compliance with PM home protocol</p>	Radiographic data and physical data are poorly correlated.	<p>Higher (worse) initial Diméglio score corresponded to less desirable outcomes. Those feet have better correction with PM.</p> <p>Rates of relapse: 22% PM, 17% FM. Not significant.</p> <p>Heel cord tenotomy occurred in 94% of PM group and 17% of FM group.</p>	The correlation between initial Diméglio score with normal gait and normal ankle motion is not significant for either PM or FM groups.		

	contributed to rates of relapse.					
<b>Study Limitations</b>	Non-randomized. Compliance was self-reported. There is no way to objectively measure the parents' manipulation skills during the home therapy part of FM.	Non-randomized. Software limitations - Foot regions may not be well defined by the software if the entire foot does not touch the footplate. Manual correction was used to define foot regions for feet that did not make total contact with the force plate. Gait and radiographs may be unreliable in young children. Compliance with protocols was not assessed or addressed in the study.	Non-randomized. Patients were not cross-evaluated by all members of the treatment team. Indications for surgical intervention differed between treatment teams. The rate of Achilles tenotomy varied throughout the study and was not explained. Compliance with protocols was not assessed or addressed in the study.	Non-randomized. Gait may be unreliable in young children. The study may have been underpowered due to the small sample size. Compliance with protocols was not assessed or addressed in the study.	Non-randomized. Compliance was self-reported. There is no way to objectively measure the parents' manipulation skills during the home therapy part of FM. Gait and radiographs may be unreliable in young children.	Studies analyzed were not homogenous. Only studies written in English were analyzed.

Abbreviations: PM, Ponseti Method; FM, French Physiotherapy Method

\* The Jeans et al. article states 56 PM and 46 FM participants were included in the final analysis for a total of 103 participants.

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