

# Foot Orthosis Prescription Habits of Australian and New Zealand Podiatric Physicians

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This research project investigated the orthotic prescription habits of podiatric physicians in Australia and New Zealand. A 23-item questionnaire was distributed to all members of the Australian Podiatry Association and the New Zealand Society of Podiatrists. When asked what type of foot orthoses they prescribe most often, 72% of respondents reported functional foot orthoses; the next most common response was prefabricated orthoses (12%). A typical prescription for functional foot orthoses consisted of a modified Root style orthosis, balanced to the neutral calcaneal stance position, with the shell made from polypropylene and an ethyl vinyl acetate (EVA) rearfoot post applied. The majority of podiatric physicians surveyed used a commercial orthotic laboratory to fabricate their orthoses. However, New Zealand respondents were three times more likely to prescribe prefabricated foot orthoses, and males were twice as likely as females to manufacture the orthoses themselves rather than use a commercial orthotic laboratory. (*J Am Podiatr Med Assoc* 91(4): 174-183, 2001)

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Foot orthoses are widely used by podiatric physicians to treat a variety of foot and foot-related conditions. Nevertheless, the term “foot orthoses” describes a myriad of devices used to affect the foot in some manner. Historically, foot orthoses have been developed and prescribed in response to increased knowledge or assumptions about foot function. In addition, a practitioner’s previous clinical experience, both positive and negative, affects his or her prescription of orthoses. This considerable variation of prescription among practitioners is further compounded by a lack of research on the effects of dif-

ferent types of foot orthoses on foot pathologies. Without adequate research to provide an evidence-based platform, podiatric physicians vary considerably in what they prescribe. Furthermore, it is difficult to develop guidelines for orthotic prescriptions when conclusive scientific evidence is not available. Therefore, it is important for these variations to be investigated and reported.

Since Merton Root<sup>1</sup> introduced the functional foot orthosis in the 1950s and 1960s, many modifications and new techniques have been proposed to advance his original ideas. For example, several modifications to the preparation of the positive cast have occurred, including the Hice method,<sup>2</sup> intrinsic rearfoot posting,<sup>3</sup> the inverted foot orthosis developed by Blake,<sup>4,8</sup> the medial heel skive developed by Kirby,<sup>9</sup> and the DC wedge,<sup>10</sup> which originated in Australia. Other techniques have used similar principles, but have employed radically different methods, such as polysectional triaxial posting.<sup>11,12</sup> Techniques have also been

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developed and modified in which the orthosis is modified in response to a new theory of foot function. The kinetic wedge, for example, was developed in response to the sagittal plane facilitation model.<sup>13, 14</sup>

In addition to variations in the basic design of foot orthoses, there are other areas where differences occur among practitioners. First, many different materials are used in the manufacturing process.<sup>15-21</sup> Second, foot orthoses can be manufactured in many different ways; practitioners generally manufacture the orthoses themselves or use a commercial orthotic laboratory. Finally, to further complicate matters, in the past 10 years there has been a relative explosion in the use of prefabricated foot orthoses, which have gained an ever-increasing share of the market.<sup>22</sup> Due to this multitude of orthotic techniques, materials, and manufacturing habits, this research project was conducted to investigate the types of foot orthoses and the prescription variables used by podiatric physicians in Australia and New Zealand. An additional goal of this project was to develop a profile of a typical orthotic prescription, if one indeed exists.

## Participants and Methods

### Participants

Participants for this research project came from the membership of the Australian Podiatry Association and the New Zealand Society of Podiatrists (now combined to form the Australasian Podiatry Association).

### Terminology

The lack of universal terminology for orthotic prescription has been identified as creating a problem for discourse on almost any aspect of orthotic therapy.<sup>23</sup> For the purposes of this study, general orthotic types were taken from the Australian Podiatry Council's *Clinical Guidelines for Orthotic Therapy Provided by Podiatrists*<sup>24</sup> and are as follows:

- 1) Cushioning orthosis
- 2) Pressure relief orthosis
- 3) Premolded/preformed/prefabricated orthosis
- 4) Molded noncast orthosis
- 5) Molded cast (no posting) orthosis
- 6) Functional (customized kinetic) foot orthosis (FFO)

Among the functional (customized kinetic) foot orthoses, the Root functional foot orthosis is classified as described by Root<sup>1, 25</sup>; it is generally balanced so that the bisection of the heel is vertical and any forefoot-to-rearfoot anomaly is supported. The modified Root foot orthosis is generally balanced so that

the heel is held in a position that will align the subtalar joint in neutral (ie, in the neutral calcaneal stance position) as described by Hice.<sup>2, 26</sup> Other devices and modifications are as previously described by the original authors.

With respect to techniques for obtaining a negative cast or impression of the foot, the neutral suspension cast has previously been described by Root et al,<sup>27</sup> and the direct pressure or Langer cast technique has been previously described by Langer and Wernick.<sup>28</sup>

### Questionnaire

A questionnaire was developed and piloted to 40 registered podiatrists across Australia. After analysis of the responses, the questionnaire was further developed and refined to the format used in this research project—a 23-item questionnaire (Appendix A). The questionnaire included sections on demographics, quantity of orthoses prescribed, assessment methods, types of orthoses prescribed, casting methods, style of customized foot orthoses, additions/materials, and manufacturing habits.

### Procedure

The questionnaire was distributed through the *Australasian Journal of Podiatric Medicine* and posted to all members of the Australian Podiatry Association and the New Zealand Society of Podiatrists. To maximize the response rate, a reply-paid envelope was included and a reminder notice was published in the subsequent issue of the journal. In addition, five state, national, and international conferences were targeted to improve the response rate from members who had not previously completed the questionnaire. Prior to distribution, the research project was approved by the University of Western Sydney–Macarthur Ethics Review Committee (Human Subjects).

### Statistical Analysis

Data were analyzed by means of cross-tabulations, and statistical analysis was performed with the chi-square test. Fischer's exact test was used when the sample size in a cell was small.<sup>29</sup> Statistical significance was set at  $P < .05$ .

## Results

### Response Rate

There were 617 eligible responses received, representing a 41% response rate. Of the respondents, 60%

were female and 40% male. Fifty-four respondents (approximately 9%) did not prescribe any type of foot orthosis; therefore, the study sample for analyzing orthotic prescriptions was 563 (Table 1). Of the study sample, 93% were from Australia and 7% were from New Zealand.

### Number of Foot Orthoses Prescribed

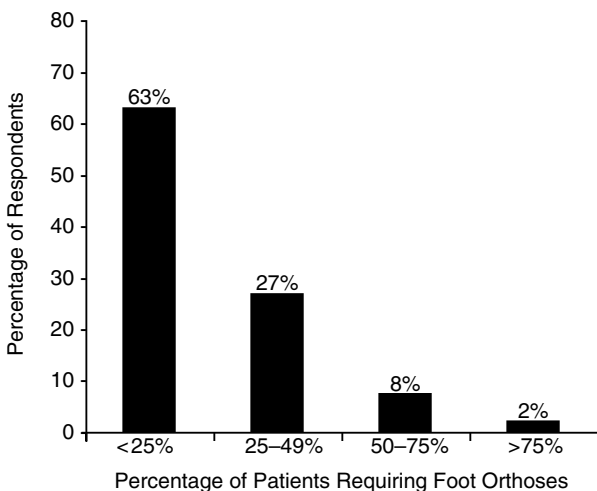
The majority of respondents indicated that fewer than one-quarter of their patients had conditions for which they would prescribe foot orthoses (Fig. 1). In contrast, only 2% indicated that more than three-quarters of their patients had conditions for which they would prescribe orthoses.

### Types of Foot Orthoses Prescribed

Of the respondents, 72% indicated that they prescribe functional foot orthoses most often; prefabricated

**Table 1. Distribution of Eligible Members and Respondents Who Prescribed Foot Orthoses**

Country	No. of Eligible Members (n = 1,505)	No. (%) of Respondents Who Prescribed Foot Orthoses (n = 563)
Australia	1,394	521 (37)
New Zealand	111	42 (38)



**Figure 1.** Respondents' prescription of foot orthoses for their patients. Respondents indicated the percentage of their patients, eg, <25%, with conditions that they would treat with foot orthoses.

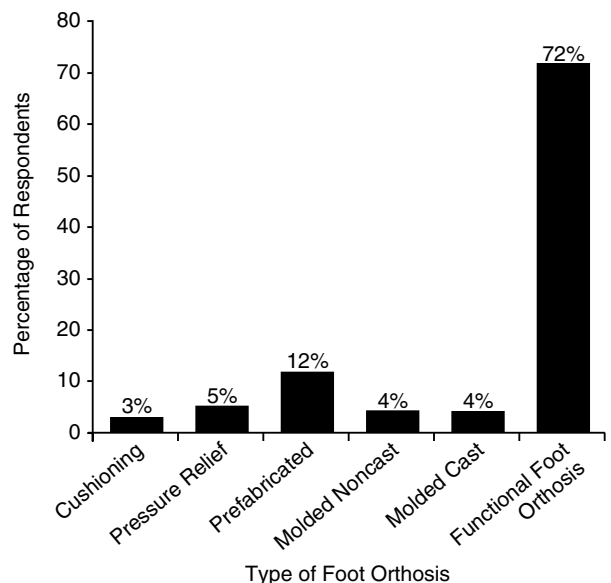
foot orthoses were prescribed the next most often (Fig. 2). However, respondents from New Zealand were three times more likely than Australian respondents to prescribe prefabricated foot orthoses ( $\chi^2 = 19.78$ ,  $df = 1$ ,  $P < .001$ ).

Of those who prescribed functional foot orthoses, the majority prescribed modified Root functional foot orthoses (52%) (Fig. 3). The second most common style prescribed was the Root style; the remainder of the orthoses prescribed were inverted orthoses and other kinds such as the DC wedge. Half of the respondents who prescribed the most commonly prescribed functional foot orthosis, the modified Root style, balanced the positive cast to the neutral calcaneal stance position (NCSP); the rest either balanced the cast with the heel vertical or used some other method (Table 2).

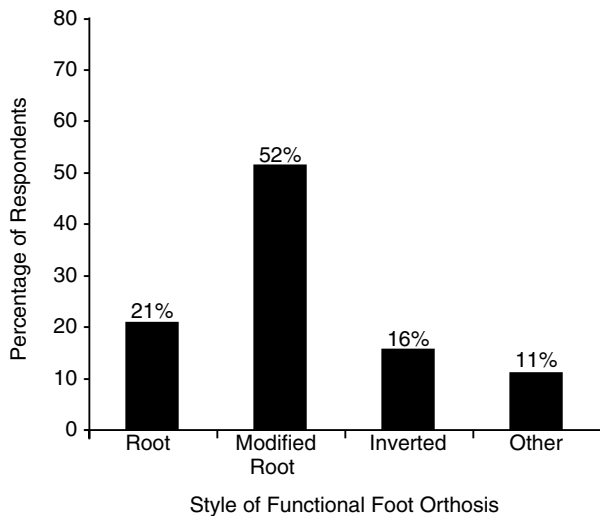
Although only 16% of respondents indicated they most often prescribe inverted style functional foot orthoses, there was a significant difference between Australian and New Zealand respondents ( $\chi^2 = 11.19$ ,  $df = 3$ ,  $P < .05$ ). Sixty-seven percent of the New Zealand respondents indicated they did not prescribe inverted functional foot orthoses *versus* 41% of Australian respondents.

### Types of Casting Used

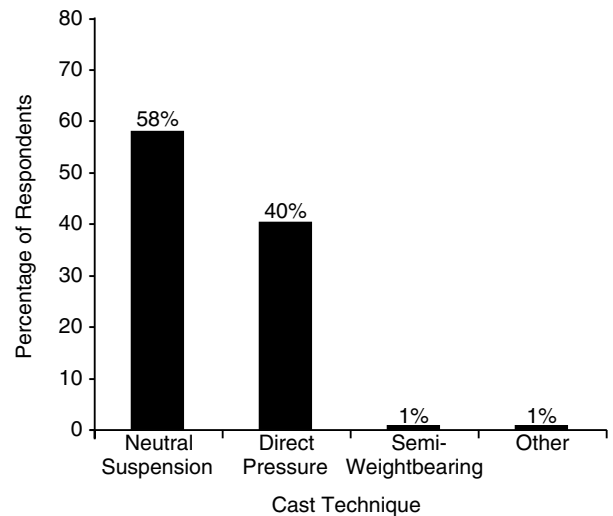
Neutral suspension casting was the most commonly used technique (58%) for obtaining a cast of the foot prior to manufacturing functional foot orthoses (Fig.



**Figure 2.** Type of foot orthosis respondents used most often.



**Figure 3.** Styles of functional foot orthosis respondents used most often.



**Figure 4.** Negative cast technique respondents used most often.

4). Most other respondents employed the direct pressure or Langer technique.

## Materials and Manufacturing

The vast majority of respondents used polypropylene most often for the orthotic shell material (Fig. 5) and ethyl vinyl acetate (EVA) most often for the rearfoot posting material (Fig. 6).

Among respondents, 70% used a commercial orthotic laboratory most of the time or always (Fig. 7), while 20% indicated they do not use a commercial laboratory. Respondents who never use a commercial

laboratory either manufactured orthoses themselves or employed technicians in their practice.

Significant differences in manufacturing habits between males and females were found. Males were twice as likely as females to manufacture foot orthoses themselves ( $\chi^2 = 10.69$ ,  $df = 4$ ,  $P < .05$ ). Consequently, there was a significant difference in the extent to which males and females used commercial orthotic laboratories ( $\chi^2 = 9.21$ ,  $df = 3$ ,  $P < .05$ ). Seventy-four percent of females used a commercial laboratory most of the time or always, while this figure for males was only 63%.

## Discussion

Although a large number of usable responses were returned (617), this represents only 41% of the potential sample. This low response rate is consistent with response rates from nondirected questionnaires in health professions generally,<sup>30-32</sup> and in podiatry specifically.<sup>33</sup> Notwithstanding the low response rate, many of the results from this questionnaire were unambiguous, indicating that further responses would unlikely change the results.

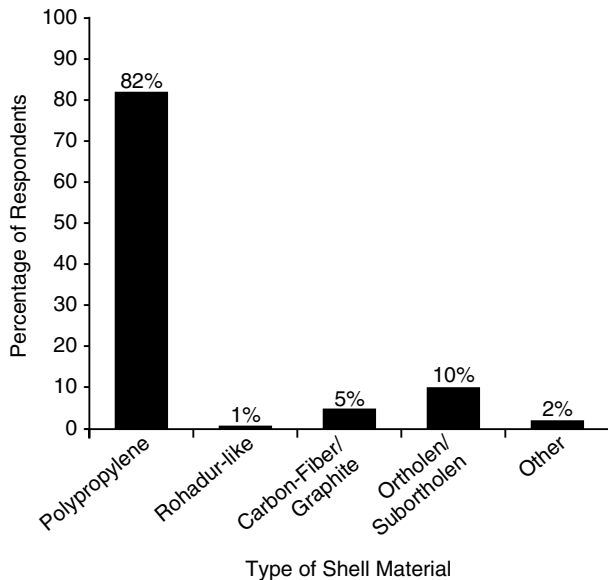
The gender split for respondents is consistent with data found in *Podiatry Labour Force* data for 1992,<sup>34</sup> which indicated that approximately two-thirds of the total work force in Australia was female (68%). The slightly lower rate of females in this survey (60%) may be explained by a decrease in the number of female graduates in the 6 to 7 years since the labor force data were collected. This is supported by fur-

**Table 2. Results of Respondents' Positive Cast Balancing Protocols for Functional Foot Orthoses**

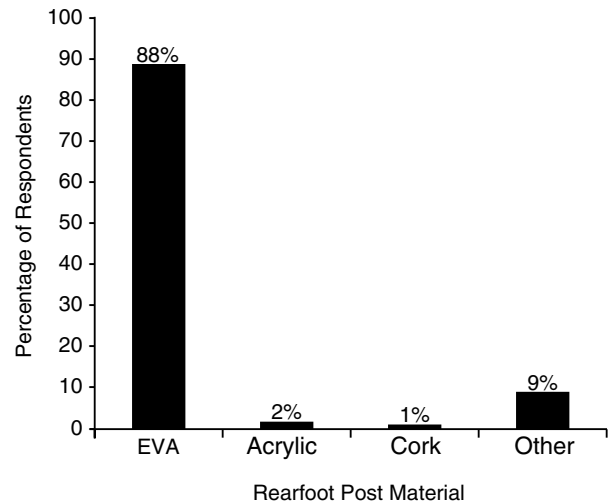
Orthosis Style	Response	% Within Each Style
Root (n = 303)	balance to vertical	54
	balance to NCSP	37
	other	9
Modified Root <sup>a</sup> (n = 422)	balance to vertical	39
	balance to NCSP <sup>a</sup>	50
	other	11
Inverted (n = 302)	<20° inversion	44
	20°–25° inversion	44
	>25° inversion	12

Abbreviation: NCSP, neutral calcaneal stance position.

<sup>a</sup>The most commonly prescribed functional foot orthosis.



**Figure 5.** Orthotic shell material respondents used most often.



**Figure 6.** Rearfoot post material respondents used most often.

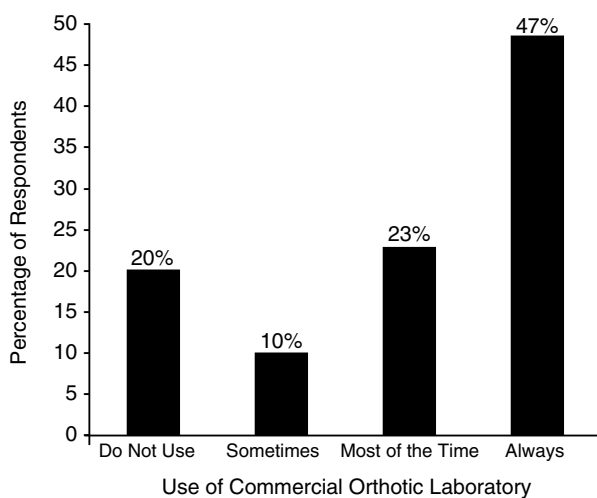
ther data in the labor force report showing that in 1992, 70% of graduates were female; by 1994, however, this number had declined to 59% and in 1995, only 53.1% of undergraduate enrollments were females.

The percentage of patients for whom respondents prescribe foot orthoses was an interesting result, given that the podiatric profession has, in the past, been accused of over prescription of foot orthoses.<sup>35</sup> More than 60% of the respondents indicated that

fewer than 25% of their patients had conditions warranting foot orthoses, while only a small proportion of respondents (2%) indicated they prescribe foot orthoses for most of their patients.

The vast majority of respondents in this study prescribed functional foot orthoses most often. In fact, respondents were six times more likely to prescribe functional foot orthoses than prefabricated foot orthoses, the second most commonly prescribed orthoses. Furthermore, among those respondents who did prescribe functional foot orthoses, the modified Root style was the most commonly prescribed style. In addition, the majority of respondents balanced the modified Root style orthosis to the neutral calcaneal stance position. The modified Root style was prescribed approximately two and one-half times more often than the second most commonly prescribed functional foot orthosis, the Root style. Prior to manufacturing cast-type orthoses, most respondents used the neutral suspension casting technique to obtain a negative cast, although the direct pressure or Langer technique was also reasonably common. More than 80% of respondents used polypropylene for the orthotic shell material and EVA for the rearfoot post material. Finally, the majority of respondents used a commercial orthotic laboratory to manufacture their foot orthoses most of the time or always.

A profile of a typical foot orthosis can be developed based upon the results of this study. A typical foot orthosis prescribed by podiatric physicians in Australia and New Zealand is a modified Root style



**Figure 7.** Frequency of respondents' use of a commercial orthotic laboratory to manufacture foot orthoses.

functional foot orthosis, balanced to the neutral calcaneal stance position, made with a polypropylene shell and an EVA rearfoot post applied. Furthermore, podiatric physicians take a neutral suspension cast prior to manufacture and use the service of a commercial orthotic laboratory to fabricate their orthoses. As previously discussed, because of the unambiguous nature of these findings, it is unlikely that the results would change even if more responses had been received. Therefore, although the authors are cautious about generalizing these findings, they are relatively confident that this style of orthosis is the most commonly prescribed device in Australia and New Zealand. It is important to note, however, that although it was the most commonly prescribed foot orthosis, there was wide variation among respondents.

It is interesting to note the level of use of commercial orthotic laboratories by podiatric physicians. As commercial orthotic laboratories are a relatively recent phenomenon in Australia and New Zealand, the high level of use reported in this study has developed rapidly. However, this growth rate is likely to ease, given that the majority of practitioners are already using laboratories. Despite the high level of use, males were twice as likely to manufacture their own foot orthoses, compared with females, who were more likely to use a commercial orthotic laboratory.

Although practitioners in Australia and New Zealand still appear to be prescribing functional foot orthoses most often, respondents clearly indicated that prefabricated foot orthoses were the second most commonly prescribed devices (Fig. 2). With the need for clinicians to use cost-effective modalities, the market share of prefabricated foot orthoses may increase in the future; further research, however, is needed to evaluate their effectiveness in comparison to other orthoses. Of interest here is that the New Zealand respondents were more likely to prescribe prefabricated foot orthoses compared to Australian respondents, generating the question, "Are the outcomes from orthotic therapy any different in the two countries?" Whether the greater use of prefabricated foot orthoses in New Zealand is good or bad is impossible to determine without appropriate health outcome trials. Such research is necessary to determine which styles of foot orthosis provide the best outcome at the least cost to the patient.

Several limitations of this study need to be recognized. First, since the response rate was low, it is difficult to generalize the findings to the entire podiatric profession in Australia and New Zealand. However, the key findings of this study were generally quite clear, indicating that further responses probably would not affect the findings. Second, the use of a

self-reported questionnaire raises the possibility that participants may not have responded honestly. However, since this was an anonymous survey, and participants were unaware of how the results were to be compiled, there was little motive for respondents not to have responded honestly. In addition, the authors could not check responses before they were returned to identify incomplete questionnaires, and subsequently obtain completion of unanswered questions. Finally, owing to variations in terminology in orthotic therapy, some respondents may not have been familiar with terms used in this questionnaire and thus may have misunderstood certain questions and responses.

## Conclusion

This study investigated the foot orthosis prescription habits of Australian and New Zealand podiatric physicians. While there was great variation in prescription, a profile of a typical prescription could be developed. The typical prescription for Australian and New Zealand podiatric physicians was a modified Root style functional foot orthosis, balanced to the neutral calcaneal stance position, made of a polypropylene shell with an EVA rearfoot post applied. Furthermore, most practitioners take a neutral suspension cast and use the service of a commercial orthotic laboratory to manufacture this device. There were, however, some differences in orthotic prescription between the two countries, and in manufacturing habits between males and females. Further research is required to compare Australia and New Zealand with other countries, such as the United States and the United Kingdom, where similar scopes of practice exist. This would provide useful information about the most commonly prescribed foot orthosis in those countries and would make data available to compare variations in prescription.

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## Foot Orthoses Prescription Questionnaire

1. What is your gender?

- Female
  - Male
- 

2. How many years have you been practising as a podiatrist?

- <5 years
  - 5 to 9 years
  - 10 to 20 years
  - >20 years
- 

3. Where did you obtain your original undergraduate qualification in podiatry/chiroprody?

- Qld.
- NSW
- Vic.
- South Aust.
- Western Aust.
- New Zealand
- United Kingdom
- Other

If you have ticked "Other", please specify:

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4. What country do you currently practise in?

- Australia
  - New Zealand
- 

5. If you practise in Australia, what Australian state or territory do you mainly practise in?

- Qld.
  - NSW
  - ACT
  - Vic.
  - Tas.
  - South Aust.
  - Western Aust.
  - NT
- 

6. Do you prescribe foot orthoses?

- No

**If you answered "No", please stop here and return the questionnaire in the reply-paid envelope – thank you for your participation.**

- Yes

If you answered "Yes", please continue.

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7. In your practice, what percentage of patients have conditions that you prescribe foot orthoses for?

- <25%
  - 25%–49%
  - 50%–75%
  - >75%
- 

8. Overall, which of the following would *best* describe your approach to clinical assessment prior to prescribing foot orthoses?

- Quantification (ie. biomechanical measurements)
- Visual assessment (eg. eyeballing)
- Combination of Quantification and Visual
- Other

If you have ticked "Other", please specify:

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9. What techniques do you use when assessing a patient prior to prescribing foot orthoses?

(Tick more than one box if required)

- Static clinical measurements
- Manual muscle testing
- Treadmill and video analysis
- Plantar pressure analysis (eg. EDG)
- Other

If you have ticked "Other", please specify:

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10. What biomechanical measuring instruments do you commonly use? (Tick more than one box if required)

- I do not take measurements
- Tractograph
- Forefoot measuring device
- Gravity goniometer
- Inclinator (roof level)
- Other

If you have ticked "Other", please specify:

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11. Of the following, which do you find the most useful clinical indicator when prescribing foot orthoses?

- Neutral calcaneal stance position (NCSP)
- Resting calcaneal stance position (RCSP)
- Difference between NCSP and RCSP
- Forefoot position
- Other

If you have ticked "Other", please specify:

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12. Of the foot orthoses you prescribe, what type do you prescribe *most* often?

- Cushioning orthosis
- Pressure relief orthosis
- Pre-moulded or pre-formed or pre-fabricated orthosis
- Moulded non-cast orthosis
- Moulded cast orthosis (no posting)
- Functional (customised kinetic) foot orthosis

*NB. The above categories have been taken from the Australian Podiatry Council's 'Clinical Guidelines for Orthotic Therapy Provided by Podiatrists, May 1998'. A Functional (customised kinetic) foot orthosis is the term used for a rigid, cast and posted (balanced) foot orthosis; for example, a Root style orthosis.*

13. Prior to manufacturing cast orthoses, what type of negative plaster cast (impression) do you take most often?

- I do not prescribe cast orthoses
- Neutral suspension cast
- Neutral cast (Direct pressure or Langer)
- Semi-weight bearing cast
- Other

**If you answered "I do not prescribe cast orthoses", please go to question 22.**

If you have ticked "Other", please specify:

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14. If you prescribe functional (customised kinetic) foot orthoses, what style of device do you prescribe most often?

- I do not prescribe functional (customised kinetic) foot orthoses
- Root
- Modified Root
- Blake Inverted
- Other

**If you answered "I do not prescribe functional (customised kinetic) foot orthoses", please go to question 22.**

If you have ticked "Other", please specify:

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**The following three questions involve different styles of functional (customised kinetic) foot orthoses. Please answer all three questions: if you do not prescribe a certain orthosis, tick the "I do not prescribe..." box.**

15. If you prescribe Root style orthoses do you:

- I do not prescribe Root style orthoses
- Balance the cast to vertical
- Balance the cast to the neutral calcaneal stance position
- Other

If you have ticked "Other", please specify:

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16. If you prescribe Modified Root style orthoses do you:
- I do not prescribe Modified Root style orthoses
  - Balance the cast to vertical
  - Balance the cast to the neutral calcaneal stance position
  - Other

If you have ticked "Other", please specify:

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17. If you prescribe Blake Inverted style orthoses what is the most common angle you balance to:
- I do not prescribe Blake Inverted orthoses
  - <20°
  - 20°–25°
  - >25°

18. When prescribing functional (customised kinetic) foot orthoses, how often do you prescribe an extrinsic rearfoot post?
- Never
  - Sometimes
  - Most of the time
  - Always

19. When prescribing functional (customised kinetic) foot orthoses, what material do you use most often?
- Polypropylene
  - Rohadur-like material
  - Carbon-fibre/graphite
  - Ortholen/sub-ortholen
  - Other

If you have ticked "Other", please specify:

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20. When prescribing an extrinsic rearfoot post, what material do you use most often?
- Ethyl vinyl acetate (EVA)
  - Acrylic (methyl methacrylate)
  - Cork
  - Other

If you have ticked "Other", please specify:

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21. When prescribing an extrinsic rearfoot post, do you prescribe motion in the post?
- Yes, always
  - Sometimes
  - Rarely
  - Never
  - Unsure

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22. Which of the following *best* describes your orthotic manufacturing habits?
- Send orthoses to a commercial orthotic laboratory
  - Manufacture orthoses yourself
  - Manufacture some yourself and send some to a commercial laboratory
  - Manufacture orthoses in your practice using technicians
  - Other

If you have ticked "Other", please specify:

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23. If you use a laboratory to manufacture your orthoses, how often do you use them?
- I do not use an orthotic laboratory
  - Sometimes
  - Most of the time
  - Always

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**Please place your finished questionnaire in the reply-paid envelope and return it at your earliest possible convenience.**

**Thank you for your participation in this questionnaire.**

**This research project has been approved by the University of Western Sydney–Macarthur Ethics Review Committee (Human Subjects). Any complaints about this research may be directed to the Ethics Committee. Any complaint you make will be treated in confidence and investigated fully and you will be informed of the outcome.**