HEALTH & SAFETY LABORATORY

Musculoskeletal Disorders in Podiatry & Chiropody Professionals

HSL/2006/60

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EXECUTIVE SUMMARY

OBJECTIVES

The principal objectives of this project were to:

- Identify and assess the risks of musculoskeletal ill health within working podiatrists.
- Identify significant potential improvements to the physical and organisational working environments of podiatrists through:
    - Informal observations of, and interviews with podiatrists.
    - Video recording of podiatrists' working posture.
    - Posture analysis using Rapid Entire Body Assessment (REBA) and Rapid Upper Limb Assessment (RULA).
    - Research into possible equipment solutions to improve podiatrists physical and organisational working environments.
    - Making recommendations.

MAIN FINDINGS

The podiatrist's work involves a combination of visually demanding work, constant access to the client's lower limbs with occasional forceful application while manipulating the clients lower limbs. However the posture assumed by podiatrists is often fixed, with certain tasks requiring very accurate hand movements and hand eye coordination. The physical positions of this type of work varied greatly with each client and dramatically affected the podiatrists posture. The types of musculoskeletal disorder risk factors observed varied from client to client included:

- Poor working postures
- The duration of the treatment involving static postures
- Amount of repetition of movements
- Changes in the working environment
- Forces applied to the patients foot
- Psychosocial issues

The varying factors were more prominent with domiciliary visits because within clinics podiatrists are able to control some of these factors.

RECOMMENDATIONS

Recommendations are made for reducing the musculoskeletal ill health arising from podiatrists working practices. These are mainly in the form of improving the podiatrists' knowledge of postural risks and health through training, redesigning of workplace environments to reduce the occurrence and extent of the uptake of unhealthy postures and the increased use of modern equipment, especially posture aids.

1 INTRODUCTION

Podiatry is a health care profession, which involves the assessment, treatment and management of patients with foot and lower limb disorders.

Recent studies[1] have identified, that podiatrists experience very high levels of musculoskeletal trouble. Seventy-one percent of podiatrists reported experiencing lower back trouble within the previous 3 months. On any given day, the data suggests that 45% of podiatrists experience low back problems, 31% experience shoulder problems and 26% experience wrist problems. When compared to other occupational groups, podiatrists experience a high prevalence of musculoskeletal disorders (MSDs) in the following body areas:

Females:
- Neck
- Shoulder
- Wrists/ hands
- Upper back
- Lower back
- Hips/ thighs/ buttocks
- Knee

Males:
- Neck
- Shoulder
- Elbow
- Wrists/ hands
- Upper back
- Lower back
- Upper leg
- Ankle

There has been an increasing awareness that podiatrists are exposed to MSD risk factors in their work, and that this may be leading to the above average incidence of MSDs among this worker population. The types of risk factors commonly associated with this work include 1) compromised postures, where joints of the body are held at the extremes of the ranges of motion; 2) static body postures, where parts of the body are held in the same posture for extended periods of time; 3) high risk postures local to the upper limbs, such as flexion or rotation of the wrist, or prolonged elevation of the shoulder, while the podiatrist reaches or stoops to access parts of the patient's foot to apply the treatment. The treatments often involve repetitive applications of force that increase the risk of injury, such as when filing nails.

Unfortunately, there is little in the way of reliable information to confirm the exposure of podiatrists to such postural risks. Such information would enable recommendations to be made to improve the working postures and physical layout of the work area. The aims of this project were to perform observations of podiatrists at their places of work, and to carry out interviews during the observations. The ergonomic tool, Rapid Entire Body Assessment system (REBA; Hignett and McAtamney, 2002)[2] was be used to attempt to quantify the level of exposure of podiatrists to the workplace MSD risk factors mentioned above, especially relating to the posture.

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1 Musculoskeletal Disorders in Podiatry & Chiropody Professionals (preliminary report), Dave Lee, Amy Jones, HSL 2004

[2] Hignett, S. and McAtamney, L. (2000)
Rapid Entire Body Assessment (REBA). *Applied Ergonomics*, 31, 201 – 205

This data was used along with the observational information collected by ergonomists to ascertain as far as possible which of the MSD risk factors play a significant role in the overall risk of MSDs in the profession. This increased understanding allowed ergonomists re-approach the design of the podiatrists workplace and working behaviours to attempt to reduce the severity of the risk factors and subsequently reduce the overall risk of MSDs.

2 APPROACH

2.1 General Approach

The approach to the data gathering from podiatrists was two fold including informal observation of and interviews with the podiatrists, and also video recording of the podiatrists' working postures.

Once initial contact had been made with the podiatrist, and meetings arranged, either one or two ergonomists met the podiatrist before the beginning of their appointments with their clients. In total 34 treatments were observed with 7 podiatrists. No attempt to influence the nature of clients or treatments was made, and these appeared to be random and representative of each podiatrist's normal treatment regime. The nature of the study was explained to each client, either upon entry to their home during domiciliary visits, or on entry of the client to the clinic treatment area. Client's permission to film the treatment was sought.

The treatment then continued as normal with the ergonomist occasionally interacting with the podiatrist to ask questions of the following nature:

- the general nature of the treatment,
- specific details of the treatment that were difficult to observe (e.g. how much force was being applied, etc.)
- any issues that may be arising during the treatment,
- how 'typical' the treatment was,
- environmental influences on the podiatrist,
- any equipment the podiatrist was using,
- how other podiatrists may differ in their approach.

Notes were made during these open-ended discussions, and notes were made during the observations of any other pertinent details. After the treatments were complete, the ergonomist had opportunity to ask further questions and discuss with podiatrists other aspects of their work, such as:

- the nature of the training they had received,
- the influences of psychosocial issues on their work,
- their daily rates of work.

After completing the observations, the ergonomist occasionally imparted advice to the podiatrist on possible workplace design enhancements and means of posture improvement based on the observations made. Some of this advice was acted upon immediately such as simple seat height adjustments, after which the podiatrists gave immediate positive feedback.

During the observation of the podiatrists, particular attention was paid to their working postures, especially where these were 'extreme' (far out of the mid point of the range of

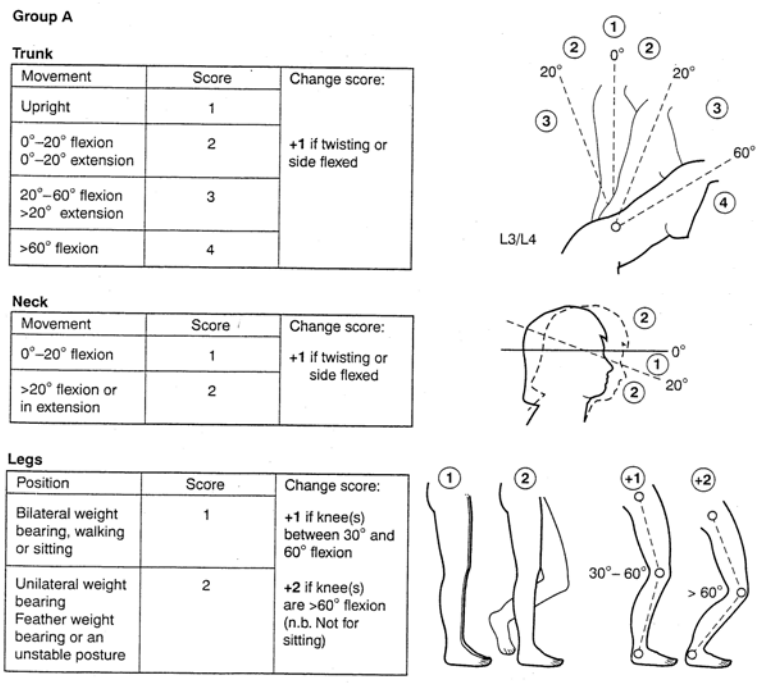
movement). Where such postures were observed (such as an elevation of the elbow or maximal flexion/extension of the wrist or forward flexion) notes were made as to the particular task of the podiatrist and the various influences on the podiatrists behaviour (for example environmental, visual, reach force application, etc.). Where this was not obvious, the ergonomist questioned the podiatrist during the treatment, (where circumstances allowed). This provided the ergonomist with an indication of any common aspects of the treatments that may influence the postural risks.

2.2 Postural Analysis Using REBA and RULA

Rapid Entire Body Assessment (REBA) (Hignett & McAtamney 2000) and Rapid Upper Limb Assessment (RULA) (McAtamney & Corlett 1993) were used as tools to analyse event driven postures captured on video and still photographs amongst podiatrists during domiciliary and clinical based work. This was intended to record and demonstrate the variation in postural related risk between these two environments. Both REBA and RULA analyses were carried out at 30-second intervals during each of the 11 podiatry treatments that were videoed.

2.2.1 Rapid Entire Body Assessment

REBA is a means to assess posture for risk of work-related musculoskeletal disorders. Snapshots of video of podiatrists were taken and the posture was observed and analysed with the REBA score sheet. REBA combines two scores, one for body (Score A) and a second for hand/arm posture (Score B). These are then amalgamated to give an overall score, which provides a risk assessment for the posture. Figures 1 and 2 give examples of the coding method of REBA.



Group A

Trunk

Movement	Score	Change score:
Upright	1	+1 if twisting or side flexed
0°–20° flexion 0°–20° extension	2	
20°–60° flexion >20° extension	3	
>60° flexion	4	

Neck

Movement	Score	Change score:
0°–20° flexion	1	+1 if twisting or side flexed
>20° flexion or in extension	2	

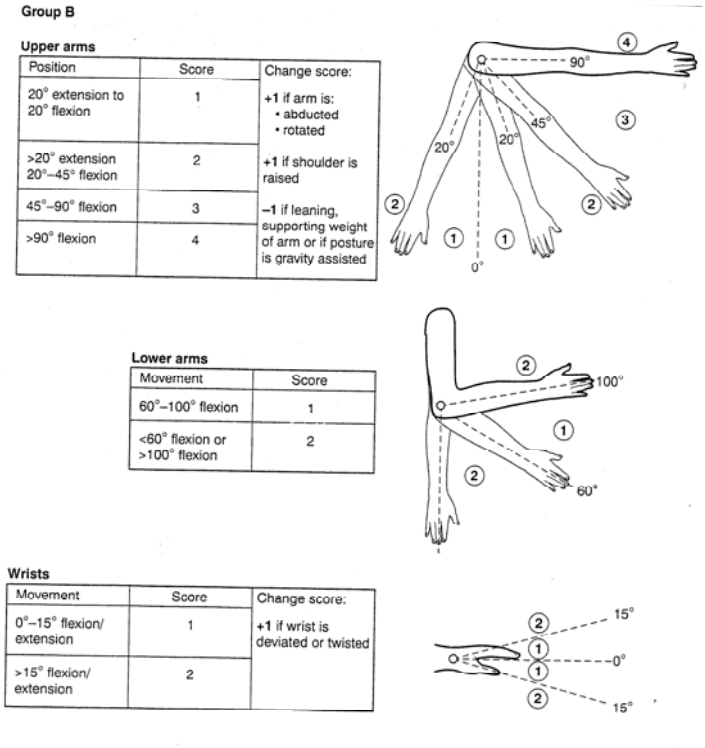
Legs

Position	Score	Change score:
Bilateral weight bearing, walking or sitting	1	+1 if knee(s) between 30° and 60° flexion
Unilateral weight bearing Feather weight bearing or an unstable posture	2	+2 if knee(s) are >60° flexion (n.b. Not for sitting)

Figure 1: Group A - body posture scoring for REBA.

A score for Group A is determined from individual trunk, neck and leg postures on a table with load/force added to take account of the physical force being applied. This determines the final Score A.

A Score for Group B is determined from individual upper arm, lower arm and wrist postures on a table. If visible, both arms are coded and the arm with the highest score is selected. Where the holding of a load is observed a coupling score is added. This ranges from 0 (a well fitting handle) to 3 (an unacceptable, awkward unsafe grip).



Group B

Upper arms

Position	Score	Change score:
20° extension to 20° flexion	1	+1 if arm is: • abducted • rotated
>20° extension 20°–45° flexion	2	+1 if shoulder is raised
45°–90° flexion	3	–1 if leaning, supporting weight of arm or if posture is gravity assisted
>90° flexion	4	

Lower arms

Movement	Score
60°–100° flexion	1
<60° flexion or >100° flexion	2

Wrists

Movement	Score	Change score:
0°–15° flexion/ extension	1	+1 if wrist is deviated or twisted
>15° flexion/ extension	2	

Figure 2: Group B body posture scoring chart.

For the entire body an overall risk score, Score C, is obtained from Score A and B in another table and an activity correction of +1 is applied for static posture, repeated small actions or a large change in posture. This produces a REBA score, with an associated level of risk and urgency for action (Table 1)

REBA Score	Risk Level	Action (further assessment)
1	Negligible	None necessary
2-3	Low	May be necessary
4-7	Medium	Necessary
8-10	High	Necessary soon
11-15	Very High	Necessary NOW

Table 1: REBA score and associated action levels.

Figure 3 provides an example of a REBA score sheet for performing a standard podiatry task.

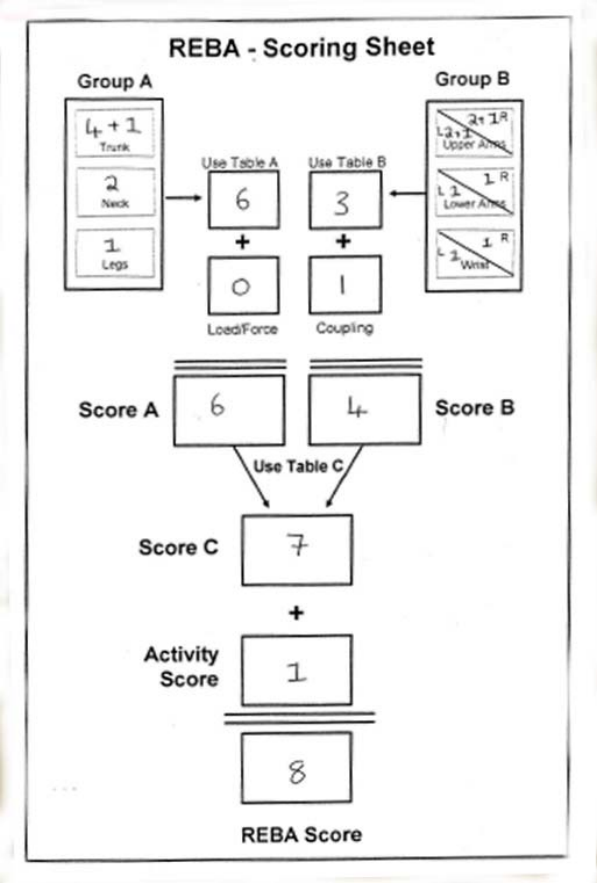


Figure 3: REBA posture score for performing a standard podiatry task.

In this example the REBA score 8 corresponds to a high level of risk, whereby further assessment is "necessary soon."

2.2.2 Rapid Upper Limb Assessment (RULA)

RULA is an alternative method for surveying workplaces where upper limb disorders are reported. It is a screening tool that assesses biomechanical and postural loading on the whole body with particular attention to the neck, trunk and upper limbs. The process of carrying out RULA is very similar to the REBA process.

Previous work in this field[1] and a significant reported evidence from industry representatives suggested that domiciliary work involved the greatest posture related risk. This was associated with the lack of control the podiatrists had over their posture, due to numerous factors such as:

- random environmental layout,

[1] Musculoskeletal Disorders in Podiatry & Chiropody Professionals (preliminary report), Dave Lee, Amy Jones, HSL 2004

- the huge variability in mobility of the patient (who were often housebound due to physical disability),
- lack of decent furniture,
- poor lighting,

The RULA/REBA scores were used to attempt to identify any quantifiable differences in the levels of postural risk between certain working conditions and methods that were observed in the clinical and domiciliary settings.

3 FINDINGS

3.1 Overview from Interviews and Observations

3.1.1 General posture overview

The podiatrist's work is visually demanding involving, constant access to the client's lower limbs with occasional forceful application. The visual aspects of the work are facilitated by positioning the clients foot slightly higher, just below eye level, where as for forceful application it is beneficial to lower the clients foot to allow the podiatrist to use larger muscle groups of the lower torso and body to apply force. Often both these work task elements are required at the same time. This creates a constant state of compromise in the podiatrists' posture where the healthiest balance between proximity to the eyes and hand/arm access should be sought.

The posture assumed by podiatrists is often fixed, with certain tasks requiring a very accurate hand movements and hand-eye coordination (such as corn or dried skin tissue treatment with a scalpel). The physical positions of this type of work varied greatly with each client and greatly affected the podiatrists posture. There were often occasions where the podiatrist assumed a bent over posture with maximal flexion in the neck to look at the top of a foot, while reaching forwards with both hands to perform minute scalpel movements in a fixed position for up to 8 - 12 minutes durations. Often this would also include sideways bending, when the part of the foot being treated was at the side, or even on the lower surface of the foot, as presented to the podiatrist.

The severity of postural compromise also varies when accessing different parts of the foot. The podiatrists posture is very different when accessing the lower part of the client's foot (such as the heel) than when accessing the upper part of the foot.

Each of these various factors, along with others discussed later in this section, have a cumulative effect that increases the likelihood that the podiatrist will assume an awkward posture. The control of these task factors to the extent that the podiatrist shall be able to assume a "safe" posture all the time will be difficult in any environment, but especially when working in peoples' homes, as is discussed below.

3.1.2 Domiciliary vs. clinical settings

There are differences in the risks associated with clinical treatments and with domiciliary treatments, the latter involving greater risk of injury due to more pronounced postural compromise, especially of the lower back and lower limbs. Commonly podiatrists reported the difficulties associated with domiciliary work, expressing a range of issues such as the following:

- lack of control over the layout of the primary task,
- compromise in personal posture necessitated due to constraints in physical mobility of client,
- inability to control the environment (especially lighting and heat),
- lack of choice in seating arrangements (often poor seating provided)
- continual reaching into tool box for equipment,

- time pressure either to:
    - finish treatment and meet next client,
    - allow client to move due to discomfort from postural fixity,
- influence of manual handling of tool bag/box and other kit.

There were numerous behaviours observed during treatment in clinical settings, which enabled the podiatrist to assume better, more neutral postures. These were linked to the following:

- provision of better equipment, especially client/patient seating and practitioner seating,
- greater adjustability in the seats for both client and podiatrist,
- generally better layout of equipment in terms of reach to access equipment
- better lighting,
- more space and mobile seating to allow the podiatrist to move their seat to access the sides of the foot instead of leaning forwards and sideways.

3.2 MSD Risk Factors

There are numerous common task factors that are known to increase MSD risk. Each of these are dealt with in isolation, with consideration given to how they might affect podiatrists' musculoskeletal well being. Special attention is given at the end of this section to the postures adopted by the podiatrists in clinical or domiciliary settings and the effects these may have on the overall risk of MSDs.

It is generally accepted that the effects of exposure to MSD risk factors are accumulative, in that the more risk factors present within a task, the greater the likelihood that the operator(s) will suffer an MSD. For example, working for long periods in a poor posture involves a certain level of risk which will be increased when the extra task factor of repetitively applying forces is added. In order to understand the details of the risks and possible impact they will have on the podiatrists these risk factors are considered in isolation.

3.2.1 Force

There were few occasions observed where the application of force may, in isolation, have caused injury to the podiatrist. Generally where hand force application was required, the podiatrist had in their possession the correct tools to perform the task and such occasions were of short duration. For example, during the clipping of nails, the closing force required on the clippers was occasionally high (for the nails of the larger digits or where a medical problem had altered the nature of the nail and caused it to thicken), but these were in isolation. In most cast, practitioners used clippers which were double hinged (cantilever) which assist by reducing the force application or used powered cutting tools such as a rotary cutting equipment or grinders. There were few occasions observed where the application of external force appeared to be at levels that would be considered high risk.

The application of force did become significant when it was necessary for the podiatrist to manipulate the patient's lower limbs, especially when lifting immobile patient's feet from floor level to the podiatrist's lap or another position in reach of the seated podiatrist. The podiatrist does this while already seated, in readiness to begin the treatment, by leaning forwards and lifting the patient's leg upwards. If the patient has suffered swelling of the leg, and it is relatively immobile, then the force required to lift the leg will be significant, reportedly up to 25kg of weight. HSE's guidance on manual handling[3] suggests that when seated, 95% of the female population can safely lift amounts of 3kg of less, if lifting above the thighs (for example from a table) with two hands. The types of lifting activity performed by podiatrists, involving up to 25kg from the floor while seated, and so bending forwards, is considered very high risk, and safer working practices should be drawn up to enable podiatrists to make these manipulations in a less harmful manner. These occasions have a highly significant effect on the overall risk of the task.

3.2.1 Duration

The duration of treatments varied, depending on the client's requirements. Observed treatments lasted from 12.5 to 35 minutes plus preamble and fulfilling post-treatment payment and paperwork. It was not uncommon for the podiatrist to remain seated throughout the entire treatment, whether on a specific mobile chair in a clinic to a dining chair in a client's home or a footstool/pouf on the floor.

After each treatment the podiatrists were observed to move around, allowing a varying amount of time for recovery from the fixed posture. Clinic based podiatrists would have from 2 minutes to 45 minutes between appointments, depending on their client bookings and punctuality of the clients, although generally this would be closer to 5 minutes "break" between clients. During this time the podiatrist would clear the tools/waste away from the previous appointment, standing up and walking around the clinic to place tools in the sink/sterilizers, waste into bins and fill out paperwork (such as clinical notes). Domiciliary workers would of course leave the premises of the client and commute to their next appointment, usually by car but by public transport in some cases. This would give them chance for recovery from the duration of fixed posture, despite often then sitting in a car for a duration while driving to the next client.

Podiatrists often reported seeing as many as 14 clients per day. The length and physical activity involved in each treatment is not easy controlled by the podiatrist, and so it is possible that of the 14 treatments given, the majority may require hard physical work, leading to tiredness and fatigue towards the end of the day. On the occasions where this happens, there may be an increased risk of injury.

3.2.3 Repetition of movement

HSE's document dealing with upper limb disorders, HSG 60, discusses high risk tasks as those that involve using the same movements every few seconds or repeating the same sequence of movements more than twice per minute. This guidance document also suggests that using the wrists/hands/fingers intensely may be a causal factor for upper limb disorders (MSDs of the upper limbs). The tasks performed by podiatrists

[3] Health and Safety Executive (REV 2002) Manual Handling Operations, 1992: Guidance on Regulations. HSE Books, London

are generally hand intensive and repetitious, although periods of repetition are generally quite short. For example, when trimming nails, similar sets of movements are repeated 5 times per foot (on each digit) but then the following activity performed often involves a completely new set of hand movements/postures.

Research by ergonomist Kilbom[4] suggests that more than 10 movements of the arm or elbow or more than 200 finger movements per minute can be considered highly repetitive and so high risk. In the case of the podiatrists there is little evidence to suggest that the number of movements are greatly in excess of these figures on a regular basis and so the repetitiousness of the movements is not considered high risk.

3.2.4 Working environment

The nature of the working environment affects the podiatrists in numerous ways, particularly in terms of postural compromise.

Lighting:
Many of the work demands are highly visual, requiring close vision of certain aspects of the foot. Where lighting is poor (especially during domiciliary work) the podiatrists were seen to compromise their posture through pronounced forwards flexion at the upper and lower back. In other words the podiatrist would crane forwards and lower their head to brings their eyes closer to the clients semi-immobile foot. Prolonged forwards flexion of the upper and lower spine in this manner has been linked to increased MSDs in the lower back. Within the clinical environment, supplemental task-specific lighting was generally provided which occasionally contained a magnifying lens to assist with very detailed work. Failing this, the podiatrist had control over the ambient lighting levels and could adjust where necessary. In the domiciliary setting, the podiatrists were subjected to the ambient lighting levels of their client's homes, which would vary according to the natural light available, the position and quality of the light sources, etc. It is expected that this would lead to an increased requirement (in terms of the number of occasions and degree of shift) to reduce the visual distance of the work area from the eye, which, may lead to greater postural compromise, especially when the client is immobile.

Reach to Equipment:
Domiciliary podiatrists tend to bring their equipment with them in a hold all carry case, which they place on the floor next to their seated/kneeling/squatting position. Podiatrists were observed on numerous occasions reaching into their bags from this sitting position, by twisting, stooping and sideways bending at the same time, as illustrated in, Figure 4:

The frequency and severity of such postures will vary according to the needs of the podiatrist, but the adoption of such postures, even very infrequently (e.g. 5 times in a 20 minute treatment. They were typically observed to occur 15 times in a treatment) will increase the risk of injury to the lower back.

Clinical workplaces tend to be better set out, with worktop space available for the placement of tools, and generally a greater amount of space to move around and collect/retrieve items. There are bound to be advantages from an ergonomic assessment and design of clinical environments, including placing most commonly used items close to hand, heavier items at waste level, functionally related items

[4] Kilbom, A. (1994). Repetitive Work of the Upper Extremity: Part I - Guidelines for the Practitioner. *International Journal of Industrial Ergonomics*, 14, (1-2), 51-57.

together etc. It was noted that not all clinically based podiatrists took advantage over their ability to lay out their own environment and still compromised their posture by having equipment stored far away from their seated position or at floor level.

Figure 4: Examples of common high risk postures, while reaching for equipment into carry case.

Temperature:
Anecdotal and observed evidence outlined a commonly occurring problem amongst domiciliary podiatrists where the client (especially older generations) chose to receive treatments while seated alongside a fireplace. The podiatrist would often sit directly in front of the fireplace, and become subjected to uncomfortable thermal loading. While this may not affect the prevalence of MSDs amongst podiatrists, it may impact on the podiatrist's levels of tiredness and fatigue, especially towards the end of the day.

3.2.5 Psychosocial Issues

The links between psychosocial issues such as increased attentional demands, lack of support and paced work set by a third party have been linked to increased prevalence of MSDs.[5] [6] [7] HSE research and guidance discloses 6 key areas of work, which if not correctly managed are associated with poor health and well-being. In other words, they are the six primary causes of stress at work:

- Demands
  - Includes issues like workload, work patterns, and the work environment
- Control
  - How much say the person has in the way they do their work
- Support
  - Includes the encouragement, sponsorship and resources provided by the organisation, line management and colleagues
- Relationship
  - Includes promoting positive working to avoid conflict and dealing with unacceptable behavior
- Role
  - Whether people understand their role within the organisation and whether the organisation ensures that the person does not have conflicting roles
- Change
  - How organisational change (large or small) is managed and communicated in the organization

Podiatry, especially when performing home visits, may involve a significant number of these work related psychosocial risk factors. For example, an NHS podiatrist visiting a lonely mentally ill patient who is the 12th patient of the podiatrist's working day may be subjected to numerous stress related risk factors. These may be any one, or more likely a combination of high demands on time, limited control over the task, minimal social or managerial support (due to limited contact with colleagues), lack of management of issues such as lone working, where there is a possibility of confrontation with the patient, or on the other hand a requirement to "counsel" the patient, a role for which podiatrists are not trained but is inevitable in their working life.

Concerns about working outside their professional role were also expressed by podiatrists in private clinics, which often were treated as shop front showrooms, dealing with cash at the end of every treatment, performing marketing duties and customer care along with fulfilling the roll of the client's counsellor and even occasionally even security and policing duties.

While it has been observed that there is some managerial or work systems support for some of these issues within the NHS and occasionally private clinics it is limited and

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[5] Devereux, J; et.al. (1999). Interactions Between Physical And Psychosocial Risk Factors At Work Increase The Risk Of Back Disorders: An Epidemiological Approach; Occupational Environmental Medicine, 1999;56:343-353.

[6] HSE Books (2002). Upper Limb Disorders in the Workplace; ISBN 07176 19788

[7] Aptel and Cnockaert (2002). European Trade Union Technical Bureau for Health and Safety (TUTB), Newsletter; 2002.

generally insufficient. For example, lone working is often dealt with individually and informally, where podiatrists will telephone their colleagues of even household partners if they feel vulnerable. No evidence of this being acknowledged or supported by management has been observed or reported during the interviews with podiatrists.

The presence of these psychosocial risk factors will impact on the musculoskeletal well being of the podiatrists with individual variation. Some podiatrists may feel comfortable with their multi-faceted jobs, where-as for others these may be a cause of regular or constant stress. As previously mentioned, stress has been linked to an increased prevalence of MSDs.

3.2.6 Postural Issues

During treatments there were often periods where the podiatrist would assume a fixed posture of the torso while performing tasks, such as corn removal, with sharp instruments. In these cases the duration of fixed posture would last up to 8 - 12 minutes, where the upper torso, head/neck, shoulder and upper limbs were held with only minor movements of the hand/wrist. Examples of sustained fixed postures are illustrated in Figure 5.

Figure 5: Examples of common fixed postures, held for up to 12 minutes during treatments given in domiciliary (left) or clinical (right) settings.

The podiatrist's posture illustrated on the left involves a pronounced forwards flexion of the neck. That on the right hand picture show's a less pronounced neck flexion as the client's foot has been elevated due to the use of a height adjustable patient chair in this clinic. The assumption of these and similar fixed postures, especially while the muscles are in contraction or lengthened will increase the likelihood of localized muscle fatigue, especially when the posture is sustained. This often leads to feelings of cramp or soreness in the muscles, which is usually alleviated once the muscle is relaxed with the movement of the affected body part. If sustained for long periods though more serious injury can occur.

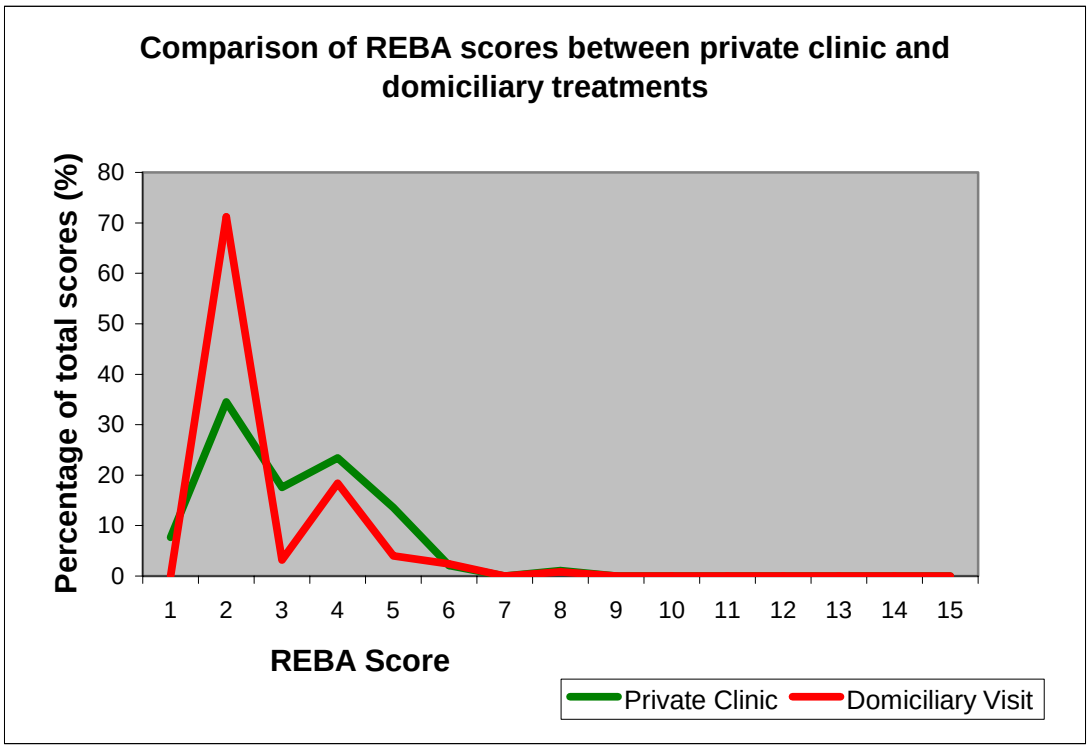
3.3 Postural Analysis Using REBA and RULA

REBA and RULA outcomes demonstrate the variation of different postures adapted between the domiciliary and clinical work performed by the podiatrists and between individuals in similar settings. From the 11 videoed podiatry treatments, 483 postural analyses were carried out using REBA, 306 using RULA. The results from these analyses varied from low to high-risk postures, which demonstrate that podiatrists adopt a large range of different postures during each treatment.

It is pertinent to point out at the outset that the numbers of REBA/RULA measures made were limited, due to constraints on filming podiatrists while working in people's private residences, especially while observing NHS podiatrists. While observations of NHS and private podiatrists were made, the following data was collected solely with private podiatrists who worked in clinical or domiciliary settings who had fewer constraints on the ergonomist using a camera while working. For this reason fewer measures were made than had been planned, and so the statistical significances of the variations in scores have not been sought, and they are intended to give an indication of postural differences instead of a direct comparison. Future work in this area will benefit from being carried out by, or in partnership with, an NHS trust where permission to film can be arranged far in advance (a process requiring up to 12 months).

REBA Comparison Between Domiciliary and Clinical Work

Given the ability of the clinically based podiatrist to control their working environment more freely, in terms of lighting, position of the client, their own seated position relative to the client's feet, the layout of their tools, etc., it was expected that the domiciliary scores would be greater (i.e. there would be generally worse postures observed for domiciliary treatments). However, the REBA results did not reflect this. Graph 1 provides comparative scores taken from both clinical and domiciliary settings, expressed as the percentage of each of the possible REBA scores.



Graph 1 **Illustrating the variation in REBA scores in domiciliary and clinical settings, expressed as a percentage of the number of scores of all those measured.**

Given that REBA scores increase with an increased level of risk, it is apparent that domiciliary workers demonstrated a greater proportion of low scores than do clinical workers and therefore seemingly lower risk. The graph shows that 71% percent of REBA scores for domiciliary workers were 2, indicating a low level of risk. This said, a significant proportion of the scores (25%) were in the region of 4 - 7, indicating a medium level of risk where REBA suggests that action (further assessment) is necessary. Compared to this, analysis of podiatrists' postures in clinical environments showed that there were a greater number of high scores and therefore an apparent tendency to higher risk postures. For example only 41% of scores were in the 1-2 region (demonstrating low-medium risk levels) and 39% of scores were in the medium level of risk.

There are a number of reasons why the REBA comparisons appear contrary to the findings from the observations and interviews made by ergonomists. These are outline as follows:

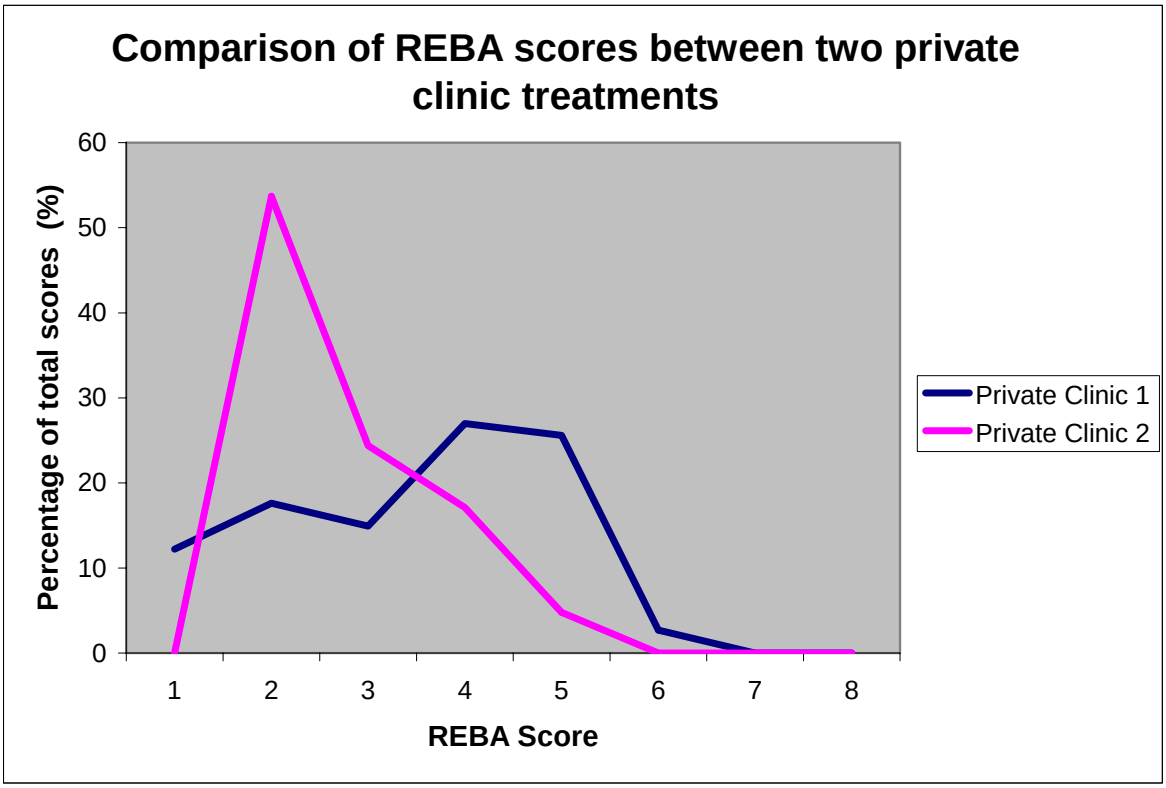
- REBA does not deal in detail with lower limb position. Generally, domiciliary work involves the podiatrist sitting on a low stool or pouf with the angle between the thighs and lower back relatively closed, and the lower legs in flexion about the knee (i.e. close to a squatting position). Such postures may put an increased strain on the lower body and torso, including an increase in the lower back stressors due to the inevitable forwards rotation of the pelvis while sitting in a low position. Clinical podiatrists however used an adjustable office type chair to sit in while treating patients and so their hips and legs were in a more open orientation, reducing the musculoskeletal strain on the lower limbs, improving weight distribution on the chair about the lower thighs and reducing

the rotation of the pelvis. REBA does not distinguish between these two postures despite there being obvious benefits to sitting in a more upright position and therefore the variation in risk due to chair choice, despite being highly significant, is not identified in REBA

- The lower position of the patient's foot and closer proximity of the foot to the podiatrist's head/eyes generally observed in domiciliary work where the foot is supported on the podiatrist's thighs led to greater flexion of the neck while looking down on the foot. REBA distinguishes between greater or less than 20 degrees of flexion of the head/neck but not further. It is quite possible (and probable) that despite scoring the same REBA scores in this aspect of the assessment, domiciliary workers tended to assume a posture significantly greater than 20 degrees of flexion whereas clinical workers tended to assume a posture of just above 20 degrees of neck flexion. This is apparent referring back to Figure 5, for example, which shows both domiciliary and clinical podiatrists working, both with forwards flexion in the neck. While REBA would provide exactly the same score for both of these positions, the domiciliary podiatrist's neck is flexed to an angle of 55° whereas the clinical podiatrist's neck is flexed only to 35 degrees, incurring less postural risk.

  Despite clinical workers being provided with a greater range of adjustment of their own sitting posture and the position of the patient, it was common to see this not being capitalised on. Either due to spatial constraints from working in a small, cramped clinic or due to lack of awareness of their own posture there was a variation in the amount of attention each podiatrist paid to attempting to adjust their working environment to provide themselves with a better posture. This is apparent in the following graph (Graph 2), which compares the REBA scores between two clinical workers.

- While they worked in different clinics, each possessed the ability to easily adjust the height of the patients, their own sitting height and their own position relative to the patient's foot (by moving their castor wheeled chars). Both also expressed a good understanding of postural issues and the benefits of working in a more 'neutral' posture. Private Clinic 1 did have significantly less space available than private Clinic 2 which may partly explain why the podiatrist made fewer attempts to alter their own seated position to gain better access to the patients foot while remaining in an upright, 'neutral' posture.



Graph 2 **Graph illustrating the variation in REBA scores between two comparable clinical settings, expressed as a percentage of the number of scores of all those measured.**

High Risk Scores in Domiciliary and Clinical Environments

For both clinical and domiciliary work 1% of all scores appeared in the high-risk category, suggesting that further action was necessary soon. These were incidences of podiatrists reaching to the floor to retrieve objects from the kit bag or look closely at a patient's foot by kneeling on the floor temporarily. These are discussed below and are shown in Figures 6 and 7.

During domiciliary visits the podiatrists tended to rest their toolboxes on the floor. This practice created the high-risk posture demonstrated in Figure 6 as the podiatrist reached downwards whilst leaning sideways resulting in forward flexion and twisting from both the truck and neck.

REBA Score = 8; Risk = High; Action necessary soon.

Figure 6: A postural high-risk task for domiciliary treatments.

During clinical visits, treatments occasionally involved fitting innersoles within the patient's shoes. This involved the podiatrist performing various tests and examining the patient's legs, feet and shoes. Figure 7 is an example of the posture podiatrists are required to adopt whilst carrying out this part of the treatment.

REBA Score = 8; Risk = High; Action necessary soon.

Figure 7: A postural high-risk task for clinic treatments.

While such high-risk postures were occasional they will affect the postural well-being of the podiatrist, especially those suffering already from lower back pain.

Overall, REBA analysis illustrated that a significant proportion of the podiatrists' time was spent in medium - high-risk posture.

3.3.2 RULA (Rapid Upper Limb Assessment)

RULA (Rapid Upper Limb Assessment) analysis was performed on representative treatments (where filming was possible) in clinical and domiciliary settings. 180 measures in clinical settings and 124 measures in domiciliary settings were taken over three representative treatment sessions. The average duration of the sessions recorded was 30 minutes for the clinical and 20 minutes for domiciliary.

	Clinical RULA Scores	Number of measures	**Domiciliary** RULA Scores	Number of measures
Treatment 1	4.3	96	4.0	58
Treatment 2	4.2	48	3.0	56
Treatment 3	3.9	38	3.4	10
Mean	**4.1**	60.7	**3.5**	41.3

Table 1 Mean RULA scores for clinical and domiciliary environments.

Once again with the affordance provided to the podiatrist working in a clinical setting to control and organise their environment, in terms of layout etc. it was expected that the domiciliary scores would be greater (i.e. there would be generally worse upper limb postures observed for domiciliary treatments). Once again though, the observations did not reflect this. Over the period of measures taken the mean RULA scores for the domiciliary workers was 3.5 whereas the mean sore in clinical settings was 4.1. As RULA is not intended as a precise tool, but instead a fast tool which provides a rapid assessment method, these figures are considered comparable.

While the statistical significance of the difference is difficult to ascertain (due to the low number of treatments where filming was appropriate/agreed) this provides some further indication that although clinical podiatrists have greater control over their environmental set up and so posture they appear to not be making adequate use of this. One of the main environmental constraints apparent at the private clinics visited was a lack of space to fit all the equipment, the patient and then the podiatrist themself. This led to the podiatrist having little space to move their seated position (i.e. roll their chair around the client) which resulted in their remaining seated in a fixed position and compromising their own posture more than is required. This may be the reason for the lack of improvement in upper limb posture amongst the podiatrists working in a clinical setting.

RULA Action Levels

The following table illustrates the four action level provided by the authors of RULA[8].

Action Level	Score	Action Required
1	1-2	Posture is acceptable if it is not maintained or repeated for long periods.
2	3-4	Further investigation is needed and changes may be required.
3	5-6	Investigation and changes are required soon.
4	7 +	Changes are required immediately.

Table 2 Action levels for RULA.

For each of the environments in which podiatrists work the RULA output suggests that, according to Action Level 2, further investigation is needed and changes to the way podiatrists work may be required.

[8] McAtammey, L.; Corlett, N.; RULA - Rapid Upper Limb Assessment Tool, Contemporary Ergonomcs, 1994

4 DISCUSSION

4.1 Posture Improvements

As mentioned previously, there is a balance between the variations of the podiatrists' postures depending on the actual work being performed. There are a number of independent factors, which make the control of the individual postures quite complex. For example while performing highly delicate, visually demanding tasks using only slight force (such as shaving off hard skin with a scalpel) then it will be beneficial to elevate the patient's foot. This will allow the podiatrist a reasonably detailed view of the foot area, without the requirement to stoop downwards. However, the podiatrist's elevated hands/wrists may need stabilising for the delicate, accurate motions required. The elevation of the patient will be relatively straight forwards in a clinical environment, where the patient's chair is hydraulically powered and the patient is well secured. The same movement in a domiciliary setting will be difficult, and will be limited (often significantly) by the mobility of the patient. In certain cases, even raising the foot from the floor onto a small footstool will be problematic and uncomfortable for the patient. Other factors come into play such as the means of stabilizing/supporting the patient's foot, which is often on the podiatrist's knee in domiciliary settings. Similarly, the exact position on the foot of the offending disorder being treated will have a significant effect on the podiatrist's reach requirements and so working posture.

Each of these various factors make giving detailed recommendations concerning posture difficult. This said, the general principle is that more visual tasks should be slightly higher to allow a good detailed view of the work area, while more physical tasks (possibly cutting nails for example) require a lower work area to allow for the use of larger muscle groups of the torso while reducing the lateral abduction of the upper limbs.

4.1.1 "Best practice"

It would be best practice, both in clinical and in domiciliary settings to allow complete independence of movement of the podiatrist from the patient. In a clinical setting, where the patient chair is easily height adjustable and the patient's foot is supported independently of the podiatrist then this should be relatively simple. In a domiciliary setting, this will mean the provision of a certain amount of equipment, such as a foot stool (preferable height adjustable) and a separate low stool for the podiatrist to sit on. Presently, especially in domiciliary work but also in clinical settings, the podiatrist generally remains in a fixed seated position relative to the patient. Within domiciliary work, it is common for the patient's foot to be supported on the knee of the podiatrist, so removing any independent movement for the podiatrist from the lower torso downwards. However the podiatrist requires access to all aspects of the patient's foot, including access to the top, the heel and the ball and the sides of the foot, as illustrated in Figure 8.

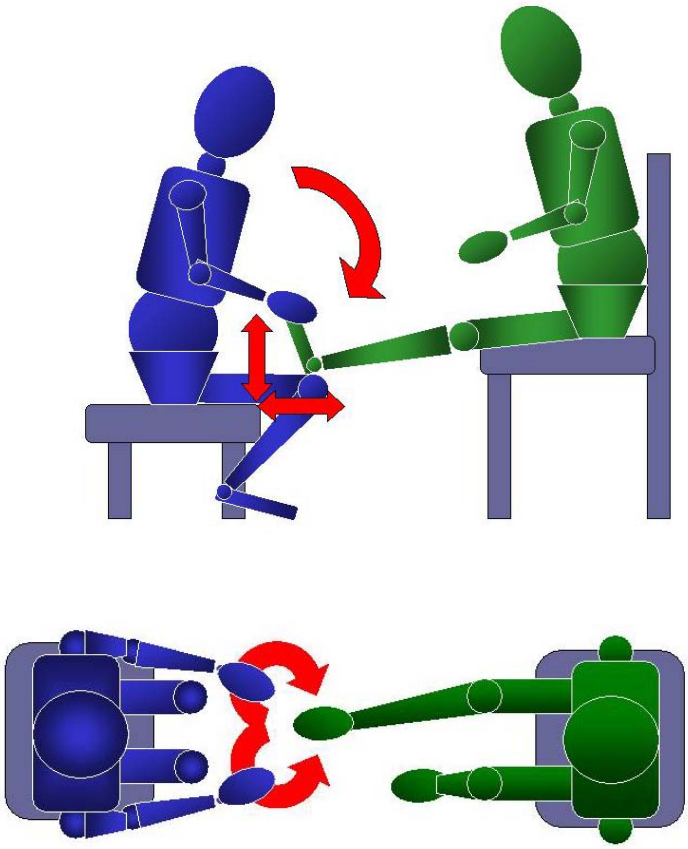


Figure 8: **Podiatrist (blue) requires access to all aspects of the patient's foot from numerous angles (illustrated in red arrows).**

In accessing the various surfaces of the foot while the podiatrists' lower torso is anchored, the podiatrist assumes numerous compromised postures already mentioned, such as neck flexion to look down to the bottom of the foot, lower back flexion, sideways bending and flexion to reach the side of the foot, etc. Only through providing the podiatrist with independence of whole body movement will these compromises be prevented. This means first of all that the patient's foot should be supported separately from the podiatrist, possibly through the provision of a height adjustable footrest, examples of which have been seen during this project (illustrated below in Figure 9). The podiatrist will require mobility in their seated position also, in terms of height of seat, fore and aft position relative to the patient and also a rotation about the patients foot, to allow access to the sides of the foot without leaning sideways. This would be best achieved by the provision of a height adjustable, mobile stool, which the podiatrist could sit on. The stool would ideally incorporate caster wheels to allow the podiatrist to move around the patient's feet, as illustrated in Figure 9. The stool should be light weight and collapsible to facilitate carrying to the patient's home from the car/transport.

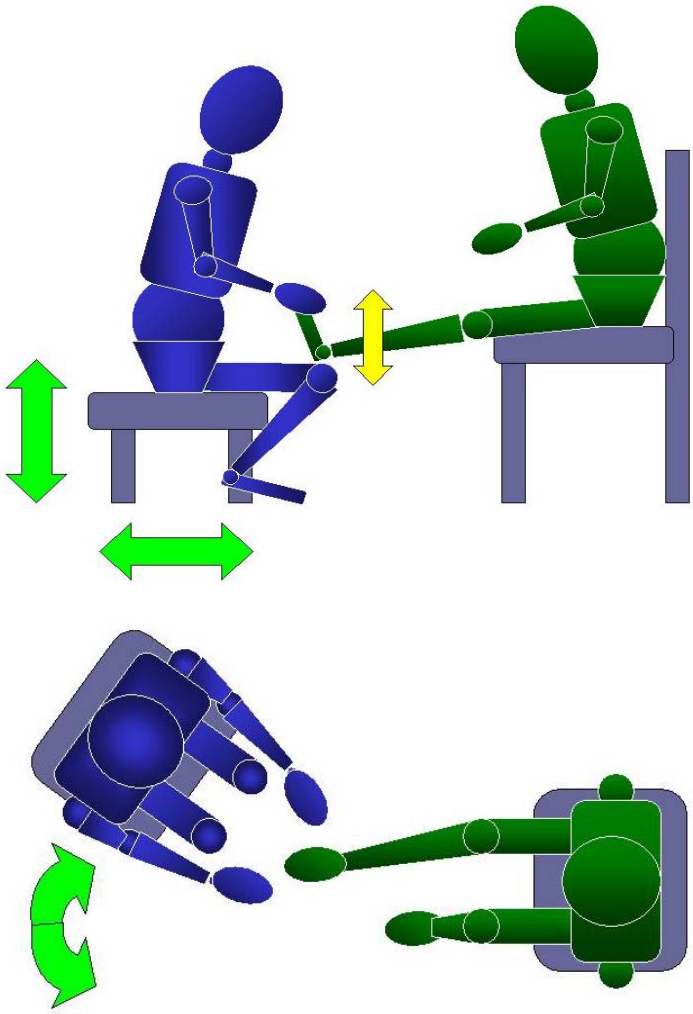


Figure 9: **Illustrating the degrees of mobility required by the podiatrist (blue) in order to be able to maintain a more upright, neutral working posture while accessing the patients foot (illustrated in dark green). Yellow arrow indicates independent movement of patient's foot height position.**

It is often important that the patient's foot be kept below their seated thigh height, both for comfort and blood flow. Often the patient suffers a lack of mobility of the knee/ankle, which will result in the foot being treated while on the floor or only slightly elevated. This will always result in compromised postures for the podiatrist, and those in a position of management should consider controls for this eventuality. These may include forward planning of patient contacts to treat patients with reduced mobility mainly at the start of the day (before the podiatrist is tired), reduced treatment times for such patients (making visits more often but for shorter periods) or staggering these patients with those who posses good mobility, to allow some periods of relief for the podiatrist. Where the podiatrist is required to assume a more compromised posture they should be trained to take regular rest breaks where they can relax their posture and not remain in the fixed, poor posture for long periods.

4.1.2 Best practice concerning use of a mobile telescopic footstool

During the observations one particular piece of equipment was noticed that is worthy of mention as it may solve numerous postural issues in clinical and domestic settings. The telescopic footstool is illustrated in Figure 10. This type of equipment provides a number of advantages, which are listed below:

- allows for height adjustment of patients foot, providing greater access for the podiatrist,
- has a small footprint on the floor, allowing podiatrist to sit closer to the patient's foot,
- is lightweight and foldable so easy to carry,
- has the possibility of fitting an integral tray to place work tools in, reducing the need to bend downwards into the kit bag to retrieve items.

Figure 10: Photograph of a telescopic, height adjustable, lightweight footstool observed in use by one podiatrist

5 RECOMMENDATIONS

5.1 Equipment Design

5.1.1 Seating within clinics

One possible solution for podiatrists seating within clinics are saddle shaped stools that reportedly maintain a less pronounced curve of the spine, even when leaning forward to work. The seated person's bodyweight is evenly distributed across the moulded saddle, which supports the body evenly while allowing for a more open angle of the hips/thighs, reducing the pressure on the spinal discs of the lower back. The saddle seat is designed to alleviate neck, shoulder and lower back pain. It is also claimed to reduce aching in wrists and arms and promote good arm-hand control by encouraging the placement of the feet firmly on the floor while sitting. An additional benefit of the saddle seats is that they are height adjustable and run on caster wheels making them easily mobile for the podiatrist to move around the patient's foot.

Figure 11: Examples of Saddle seats (left taken from www.beautelle.co.uk and right taken from www.medicalresources.com).

Paddle extension units provide arm/hand support while situated at the front of a saddle seat. The paddle extensions rotate and can also be positioned to provide additional back or side support (Figure 12). Extension like these will reduce the shoulder and upper back muscular forces required while holding the arms/hands in a fixed position by providing support for these limbs.

Figure 12: Saddle seats with arm/hand support (Left). Saddle seats with back or side (Right). Both examples source - www.beautelle.co.uk

Alternative products, which may be beneficial, include the Posiflex chair. Posiflex chairs consist of a stool with backrest and moveable elbow supports. These extra postural supports reportedly reduce shoulder, neck and upper back MSD symptoms. Examples of posiflex chairs are shown in Figure 13. Again, these chairs are height adjustable and run on caster wheels for whole body mobility around the patient's foot.

Figure 13: Posiflex chairs Sourced from www.posiflex.ca

Patient chairs have been greatly improved over recent years and now allow extra mobility and comfort to the patient. The majority are height adjustable, have seat-tilting movement, individual leg height adjustability and arm supports for patients. All these movements allow podiatrists to adjust patient's legs and feet to the required height to enhance their working posture whilst carrying out treatments.

Figure 14: Example of a patient chair for podiatry clinics. Source - www.trycare.co.uk

However a positive change is needed within the development of these patient chairs. The design involves the lifting/supporting mechanisms of the chairs being at the base, and these are often cumbersome with a large footprint. This results in a reduction in the amount of floor space available underneath the patient for the podiatrists to position their chair and sit with their legs underneath the patient's chair. A reduction in the size (footprint) of the elevation/support mechanism underneath the patient chair would enhance a podiatrist's posture by leading to a reduction in forward flexion and bent neck/stooping postures that were noted during the monitoring of working podiatrists.

The position of the adjustment controls is also important when considering the design of the patient's chair. In some instances the controls were placed at the head end of the patient's chair, forcing the podiatrists to alight from their own seat, walk around the patient and make adjustments. While this is theoretically advantageous, in that the podiatrist is becoming mobile and reducing the effects of holding a fixed posture, it resulted in the lack of inclination on the podiatrist's part to make minor alterations to the patient's position that would have benefited their postural position. The controls for patient chairs should be easily accessible, accurate and simply used. Foot controls are common, and hand controls are also available.

5.1.2 Seating for domiciliary visits

During domiciliary visits, patients sit on their own furniture while they receive treatment. This furniture is generally a sofa, armchair, dining chair or wheel chair, none of which posses height adjustability so the height mobility of the patient's feet is limited to the patient's knee height (patient sitting straight legged), and dependent on the patient's joint mobility, which is often poor. Podiatrists need to have a low seat and sit closer to the ground, to access the patient's feet while minimising the forward flexion at their neck and trunk (stooping). Some podiatrists were observed to use low stools and provided positive feedback about their comfort and ease of transportation. There is not one suggestion for domiciliary visits that would suit every environment or podiatrist, therefore three alternative solutions for podiatrists seating and posture during domiciliary visits are listed below. The first suggested intervention is the simplest which provides the least benefit but will be more generally applicable. The latter involves a more complex set-up but would possibly provide the greatest benefit.

1. The provision of a simple, collapsible "foot" stool with a fixed or possible adjustable height would be sufficient for most podiatrists, and would be a significant improvement on present working practices where the podiatrist uses any seating device which is available. Fixed stools could be chosen for fit to the individual user according to their own comfort (which will depend on lower limb anthropometry and individual mobility). The stool should be foldable and lightweight to make it easier to transport to patient's houses. An example of a useful stool is a Burley portable stool as shown in Figure 15. It is small, foldable and lightweight. However it still offers a padded seat and is height adjustable. This stool would work well with a footrest for the patient (see solution 3 below) or would allow placement of the patient's foot on the knees/lap of the podiatrist.

Figure 15: Burley portable stools, source - www.beautelle.co.uk

2. Placement of the patient's foot on the knee of the podiatrist is common practice, but often results in the forward flexion of the neck as the podiatrist stoops to look downwards at the various areas of the patient's foot. This stooping may be alleviated somewhat of the podiatrist uses a firm cushion, placed on their knee to elevate the patient's foot, while they are seated on the type of stool mentioned above in solution 1. While reducing the stooping, the slight elevation of the foot will mean that the podiatrists raise their arms slightly to reach and work on the foot by flexing at the elbows. If exaggerated, this may make the arms tired, and so an optimal in posture should be sought, finding the compromise between the optimal height of the patient's foot and the best

position of the arms and neck. Using a padded tray instead of a cushion would facilitate the placement of the necessary work tools close to the reach of the podiatrists before they assume a fixed sitting posture on the stool. This would reduce significantly the frequency of bending downwards to retrieve work items from the workbag, which is usually on the floor.

3. The benefits of providing the podiatrist with independent movement around the patient's foot have already been mentioned previously in this report. The final suggested improvements incorporate the use of a stool for the podiatrist (as identified in this section of the report above as solution 1) and a separate footstool for the patient. Section 4.1.2 above identifies one model of footstool that has been observed to be a successful addition to the podiatrist's supportive furniture. Height adjustability of the patient's footstool is important to accommodate as many patients as possible, especially those with minimal mobility in their lower limbs. Raising the patient's foot from the floor even a small amount will be beneficial, resulting in reduce flexion of the seated podiatrist's spinal posture. Once again the footstool will need to be lightweight and compact to facilitate easy handling to the patient's house.

   Ideally this footstool would posses as small a footprint on the floor as possible to allow the podiatrist to straddle the stool and get their legs underneath the patient's foot, reducing the need for forwards reaching to access the foot. It would function in a similar way to the use of the podiatrists' legs as a support, but would allow the podiatrist to adjust the height of the foot when advantageous and freely alter their orientation around the foot without requiring the patient to raise their leg from the foot support.

5.1.3 Podiatrist’s tools

It was noted that podiatrists were often using tools with small handles, occasionally resulting in awkward gripping postures, which can lead to an increased likelihood of upper limb disorders. While the detailed work performed by podiatrists require small accurate tools there may be benefits in testing tools with larger handles to facilitate more full-handed gripping and greater opportunities for varying the grip style while working in different orientations. For example, modifying a scraper to incorporate a handle of a larger diameter with a padded grip texture may increase the grip comfort, especially for sustained use of the tool involving repetitive force applications. An example of such an intervention has been identified in HSG121 *A pain in your workplace, page 40.*

5.1.4 Tool transportation for domiciliary visits

Podiatrists transport their own tools when performing treatments in people’s houses and it is common practice, for hygiene reasons, to carry a full complement of tools for each individual patient. At present podiatrists tend to carry hand held toolboxes, however these can be heavy (reportedly exceeding 12 kg) and are often carried using both hands or on one shoulder. HSE's Guidance on The Manual Handling Operation Regulations provides guideline figures for load weights in various positions relative to

the body. Where the actual loads being carried exceed these guideline load weights, it is recommended that risk assessment be made and risk reductions be sought.

Commonly the podiatrists' tool bags are stored in the boot of the car and are retrieved upon arrival at the client's home. Raising the bag from the car boot involves a lift of the bag from between knee and waist level, generally a few centimetres away from the podiatrist's body. For lifting from such areas, HSE guidance suggests that weights of around 13 kg for females would be appropriate for a two handed lift (or possible as low as 7 kg if forwards bending is required), above which risk assessments and controls should be considered. There is presently no guidance to individual podiatrists on the size and weight of their kit bags and it would be useful to provide this, so that individuals can make informed decisions when deciding what to take with them on domiciliary visits. A suggested maximum weight for kit bags is 13 kg, which should be safe, if not comfortable, for 95% of the population to lift and carry less than 10 m if using good technique and two hands.

The environments and distances over which the tool bags are carried will vary, but will commonly involve negotiating inclines, steps, poorly maintained paths and may be for a considerable distance. For such environments it is inevitable that the tools bags will be carried and not wheeled. However, for a significant number of visits some risk can be taken out of the transportation through the use of wheeled luggage containers. Examples of alternative toolboxes are shown in Figures 16 and 17. The introduction of these new tool cases (Figure 16) would reduce the strain placed on podiatrists. While keeping the tools within a small container, the new cases would allow a pulling transportation method rather then the usual carrying method.

Figure 16: Tool transportation cases, left source - www.trycare.co.uk and right source - www.toolkitpeople.com

Figure 17: Lightweight trolley for aided transportation of podiatrists tool bags source- www.marketeer-london.com/trolleys.

These lightweight trolleys are cheap and easy to adapt to current podiatrists toolboxes. However they still offer the benefit of reducing the amount of carrying, by introducing the pulling method. These trolleys are easily collapsible and small in size, however they are sturdy and capable of carrying loads up to 70 kg.

5.2 Clinical Layout And Storage Of Equipment In Clinics

Space is the limiting factor that influences the clinical layout of podiatry treatment rooms. Ideally though the treatment room should be large enough to incorporate a mobile, wheeled podiatrists' chair that would be able to move around the whole of the foot end of the patient's chair. This will lead to greater movement of the podiatrist's whole body and so reduce the amount of bending, stretching, twisting and reaching that becomes inevitable when adapting to working in small, camped conditions. The podiatrist's tools should close to elbow height and within arms reach of the working location. One possible solution for tool storage would be on a mobile stand, to allow the podiatrist to manoeuvre the tool to the area of need, depending on the area of foot being treated, and move the tools away when they become a obstruction. This would be especially beneficial if, as is suggested, the podiatrist begin to become more mobile in their seated position relative to the patient.

Tools are generally stored within cupboards in the clinical treatment room. However in one of the clinics visited, tools were stored at low levels, which meant that podiatrists were adopting awkward stooping postures to obtain the tools required. If these tools were located at desk/elbow height, in close working proximity to the podiatrist, this would reduce the number of awkward postures adapted by the podiatrist whilst obtaining tools during a treatment and so reduce the exposure of the podiatrist to MSD risk factors.

5.3 Training

Only one out of the seven podiatrists interviewed (NHS and private) during the study recalled receiving any training regarding postural comfort or safety and the types of musculoskeletal damage that could occur from working in poor postures. The

individual that did recall receiving training "over seven years ago" was putting this to good use, in terms of managing his own musculoskeletal well being through exercise, stretching and awareness while working.

As podiatry, both domiciliary and clinical, involves the uptake of compromised postures to some extent then it is important that podiatrists are given training in how to minimise the effects of these inevitable compromises on their musculoskeletal well being. Ideally, this should come from a number of sources:

5.3.1 Curriculum in Colleges

There is certainly scope to include in the college curriculum training on general postural, musculoskeletal well-being and whole body anatomy. Podiatrists are trained in certain aspects of the musculoskeletal system and it would not involve a great deal of extra knowledge to enable them to understand the risks involved in the uptake of the kinds of postures they can expect. Some colleges/universities may already include this kind of training in their curriculum with assistance of their in house physiotherapy departments. It would be advantageous to normalize this aspect of the training throughout the UK and develop a minimum standard for the content to ensure that each learning centre commits to including this training for the upcoming professional podiatrists.

5.3.2 Continual Professional Development

There may be scope for the organisation of MSD reduction training courses to be included in the continual professional development of podiatrists through industry bodies such as The Society of Chiropodists and Podiatrists who is both the professional body and trade union for registered podiatrists. The provision of such training is already commonplace in industries where manual handing is performed, where each individual in the industry receives "safe handling training" at some point early in their work life.

5.3.3 Induction training

While induction training is provided at the NHS trust where much of this research took place, it reportedly does not include any posture training. There is scope to include physiotherapists from the NHS trust within this training who could identify actual workplace risks and realistic means of working in a health manner. Once again, a minimum standard for this information could be developed with the assistance of industry representative, ergonomics and physiotherapist input.

5.3.4 Product Purchase Information

It is becoming increasingly common for retailers to provide training with their products that encompasses more than the simple instructions on how to use the product. More often, these contain a message about health and safety issues, for example providing information on DSE workstation set-up with a computer. Especially where these products are to be used for the betterment of the podiatrists posture (such as postural enhancing seating for the podiatrist or patient/treatment beds) the provision of *quality*

information with the products supplied may be one more in road to exploit in order to get this message to the podiatrist.

5.3.5 General Awareness Raising Through Publication

It may be beneficial to produce an article for inclusion into a circular or popular industry journal highlighting the outcomes of this and the previous HSE study and including some basic tips for personal posture management and control of personal exposure. To be effective however, this route would need to be repeated regularly with slightly varying themes to keep reader interest and ensure a wide reception of the message.

5.4 Patient Management and Education

It has been observed that there is a general emphasis placed on patient's self care in the messages communicated by the podiatrists, certainly those based in the NHS. It maybe beneficial to capitalise on these messages for the purpose of MSD risk reduction, by requesting assistance from the patient before the visits are made. Asking the patient to remove their own shoes (where possible) before the arrival of the podiatrist (or wear simple slip off shoes) would reduce the occasions where podiatrist perform this function, which involves their reaching downwards to elevate and support the patients foot. Asking the patient to provide a decent stool for the podiatrist to sit on (with guidance as to what would be considered good stool design) would be of benefit (certainly better than nothing being provided). Educating the patients on the increased risk for the podiatrist of domiciliary visits versus clinical appointments, to encourage those patients who are 'occasionally' mobile to make the journey into the clinic may reduce the overall number of the higher risk domiciliary visits required.

It may be than such minor communications, perhaps written on the appointment card as simple bullet points for example, may help to alleviate a small but significant percentage of the overall exposure of the podiatrists to the MSD risk factors.

6 CONCLUSIONS

The issues surrounding the high prevalence of MSDs amongst podiatrists are predominantly associated with the poor postures assumed while working, especially when these postures are sustained. Focussing on environmental and work equipment changes will assist to alleviate some of the reasons for the uptake of these poor postures but will only do so partially, as the majority of the environmental influences are outside of the podiatrists' control.

There is evidence from the observations and interviews that the level of awareness of the risks is generally low. For example there are numerous reported benefits of working in clinical settings in terms of postural controls, but these are not being fully capitalised on by the podiatrists working in these environments. There are numerous possible interventions presently on the market that would assist the industry in terms of suitable seating equipment, patient foot supports etc. but there is presently little motivation to purchase and use these.

The lack of awareness amongst the podiatrist occupational group, of the level of MSD risks they are presently subjecting themselves too should be dealt with in the form of awareness raising and training both amongst newcomers to the industry and present practitioners. The training should focus on the important these issues and the possible impact on the well being of the individuals in the industry and furthermore how they might continue their practice in a safer manner, reducing the risk to their own well being through practical, pragmatic steps. This would then equip the individual podiatrist to make informed assessments of their own postures and provide them with the knowledge to make corrections where necessary. Other interventions should certainly also be explored, as suggested in this report, but without a widespread increase the knowledge and awareness of the podiatrist population these interventions will only be of limited value.

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