

# Experiences of people with Multiple Sclerosis using textured insoles: an interpretive phenomenological exploration

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## Research article

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# Abstract

Background Impaired balance and mobility is one of the most concerning symptoms experienced by people with Multiple Sclerosis as it reduces their independence. It can be caused by reduced plantar sensation. Textured insoles may have the potential to improve balance and mobility by increasing plantar sensory input but their acceptability has not been investigated. This study aimed to investigate the experience of people with Multiple Sclerosis who wore textured insoles in free living for three months. Method A qualitative study embedded within an exploratory randomised controlled trial. Seven participants with Multiple Sclerosis who were ambulatory with a unilateral walking aid were identified from a larger group in a study into the effects of textured insoles on balance and mobility. Participants who wore textured insoles for three months in free living were recruited to participate in focus groups or individual semi-structured interviews about their experience of wearing the insoles. Themes in the data were identified using interpretive phenomenological analysis. Results Three overarching themes were identified from transcribed data; perceived benefit of the insoles, comfort of the insoles and participants' awareness of their feet. Participants' experiences were individual; some found the insoles beneficial and experienced increased mobility confidence whilst others did not. Several participants experienced increased awareness of their foot position. Only those participants who experienced benefits from wearing the insoles would continue to engage with them as an intervention. Conclusions Participants reported different experiences of wearing textured insoles, some experienced significant benefits to mobility confidence and awareness of their feet whilst others did not experience any benefit. Trial registration ISRCTN reference number ISRCTN85766784, date of registration 7th April 2014. <https://doi.org/10.1186/ISRCTN85766784>

## Background

Impaired balance and mobility are two common symptoms reported to be of most concern to people with Multiple Sclerosis (MS) due to the threat they pose to independent living (Heesen, 2008). Balance and mobility problems can occur due altered sensation on the plantar surface of the feet, which is attributed to axonal damage in MS. Plantar cutaneous sensation contributes to postural control by providing sensory information about the position of the foot and the supporting surface (Kavounoudias *et al.*, 1998 and 1999). Reduced plantar sensation has been correlated with reduced postural control during quiet standing in people with MS (Citaker *et al.*, 2011). The link between impaired balance and plantar sensory deficits has prompted the development of intervention strategies that target plantar receptors. Insoles with a textured surface present a simple method for continuous enhancement of plantar stimulation, most likely via stimulation of the Merkel cells, type I slow adapting mechanoreceptors in the plantar skin, which are responsible for texture sensation (Johnson, 2001; Kennedy and Inglis, 2002; Hatton *et al.*, 2012).

Preliminary studies indicate that wearing textured shoe insoles may benefit people with MS although their results are inconclusive (Kelleher *et al.*, 2010; Dixon *et al.*, 2014; Kalron *et al.*, 2015). Kelleher *et al.* investigated the immediate effects of wearing a textured insole on kinematic and kinetic gait parameters

and lower limb muscle activation. Participants reported subjective feelings of improved lower limb stability, and demonstrated greater hip and knee range of movement in the sagittal plane, greater ankle dorsiflexion and an increase in peak acceleration ground reaction force. They found an increase in lower limb muscle activation when participants wore the textured insoles. Dixon *et al.* (2014) explored the effects of textured insoles on spatiotemporal parameters of gait and centre of pressure excursion in bilateral standing with eyes open and closed over a two-week period in people with MS. After two weeks wear, participants allocated to the textured insoles demonstrated longer stride length but there were no significant changes to centre of pressure excursion, indicating no change to balance control during standing. Kalron *et al.* (2015) also investigated the effect of textured insoles on spatiotemporal gait parameters and centre of pressure excursion in bilateral standing with eyes open and closed over four weeks. There were no changes in gait parameters between groups; however, balance showed an immediate improvement in the form of a reduced centre of pressure path length and sway rate that was maintained at four weeks but only with participants' eyes closed. Across all of the studies available, most have examined spatiotemporal, kinematic and kinetic parameters of gait or centre of pressure excursion. Whilst these objective outcomes do not clearly support the use of textured insoles it is important to note the paucity of evidence associated with patient's perceived benefit of using insole interventions. It may be that there are functional improvements that are not captured using laboratory-based outcome measures. Rather, subjective outcomes derived from the perception of the patient may shed a different light on these types of interventions in a population that is in need of effective therapeutic strategies for improving community participation and independent living.

For a health intervention to be successful it needs to be adhered to correctly by users (de Seze *et al.*, 2012). Users are more likely to adhere to an intervention if they perceive it to be of some benefit; which is closely linked to patient engagement (Costello *et al.*, 2008; Bulley *et al.*, 2014). Therefore, when trialing a new intervention, it is important not only to assess its efficacy to alleviate symptoms but also how users perceive it. The aim of this study was to better understand the experience of people with MS when using textured insoles and to assess how acceptable textured insoles are as an intervention to support mobility.

## Method

A qualitative study was embedded within an exploratory randomised controlled trial of the effect of textured insoles on balance and walking ability in people with MS. The trial comprised three arms; (i) no-insole (control) group; (ii) smooth insole group and (iii) textured insole group. This study focused on the experiences of participants wearing the textured insoles.

### *Sampling and participants*

Participants (five female and two male, mean (SD) age 52 (10.6) years, range 32-65 years) were recruited from the 35 people who had taken part in the textured insole group of the randomised controlled trial in which this qualitative study was embedded. Participants had clinical diagnoses of MS, were ambulatory with either none or one unilateral walking aid and had not had an exacerbation of their symptoms within

three months of taking part in the study. Purposive sampling was used to capture experiences from men and women of a range of ages (Curtis *et al.*, 2000). Participants were made aware that their conversation would be recorded, transcribed and that their comments might be used anonymously in future reporting. All participants were willing to provide written informed consent for this process. Ethical approval was obtained from the Newcastle and North Tyneside 2 Research Ethics Committee (14/NE/0043). The study was registered with the clinical trials registry under ISRCTN85766784.

### *Semi-Structured Interviews*

Individual semi-structured interviews were conducted with four participants (Table 1) by an experienced clinician. Participants were allowed to talk in detail without interruption unless they significantly strayed from the topic or stopped talking for a prolonged time, at which point they were prompted with the next question by the clinician leading the conversation. Depending on the direction of the discussion, follow up questions were tailored for the individual situation and did not necessarily adhere strictly to the pre-listed questions. Care was taken not to introduce new topics or ideas/phrases that didn't belong to the interviewee. Recordings of each interview were transcribed verbatim for analysis by the clinician who had conducted the interviews.

Table 1: Questions followed during interviews. – insert table here.

### *Focus groups:*

A small focus group was held at a local MS support group with three participants. These participants expressed a preference to discuss their experiences in a group setting rather than individually. The topic guide (Table 2) was used to initiate conversation but, as with the interviews, participants were allowed to talk freely around these topic areas. The number of topics was condensed for the focus group and asked in a different way to encourage an open conversation. Recordings of each conversation were transcribed verbatim for analysis.

Table 2: Topic guide for focus groups. – insert table here.

### *Data analysis:*

Interpretive Phenomenological Analysis (IPA) was used to identify emergent themes in the transcripts from the interviews and focus groups. This method was used to facilitate understanding of participants' experiences of wearing the insoles since it comes from the phenomenological approach that examines the ways in which people interpret their own knowledge (Heidegger, 1996; Smith *et al.*, 2009). The analysis for each transcript followed the process described by Smith *et al.*, 2009 with adjustments to allow for the analysis of focus group data as described by Smith (2004) and Tomkins and Eatough (2010). Repeated reading with concurrent note taking, initially for idiographic accounts and then for group dynamics, led to the identification of common emergent themes.

The application of IPA to focus group data has been questioned since IPA was developed with an idiographic focus to analyse personal experiences of individuals (Smith 2004; Tomkins and Eatough, 2010). However, focus group data has been used in other IPA studies, on their own and in combination with data from individual interviews, and arguments have been made that the possible drawbacks in using a group setting to explore personal experiences are minimised when the issues are not of a highly sensitive nature (Brocki & Wearden 2006).

## Results

### *Emergent themes*

Analysis of transcripts from conversations and focus groups identified three themes. Talking about maintaining independence led naturally into discussion around whether the insoles had any benefit for mobility, which formed the first theme. The second theme concerned the comfort of the insoles, whilst the third theme developed around the participants' heightened awareness of their feet when wearing the insoles.

### *Benefit of the insoles:*

It became apparent when talking to participants in the textured insole group that opinions varied considerably regarding their effectiveness. Four participants experienced substantial benefits from wearing the insoles. Notably, a beneficial experience did not necessarily need to include an observed change in mobility on the part of the participant. One female participant described an improvement in balance, both static and dynamic, rather than walking specifically; it was the effect that this had on her confidence to mobilise and a perceived pause in progression of her disability that seemed to have further reaching consequences for her general feeling of wellbeing:

*"They're fantastic [the insoles] and they're so, I mean it's not like, um, I'm not running along, it's not helping my walking but it's helping my balance definitely. It's not helping the legs go any better but certainly the balance, which is fantastic cos it's, it's horrible when your balance is bad and you're, you know, I've got my stick but then I'm also holding on and scared."* (Participant 192, female, 56 years old)

*"I mean people say "oh, you look so well" so it's the whole thing I suppose and also I'm more confident doing things... the physio had ordered me a three-wheeled push-along thing which was like a, and I haven't, I haven't used it at all, it's just there. It's there to look at so I'm getting used to it a bit but I haven't had to use it, which has been fantastic... I will have to use it sometime I'm sure but it's, um, it's... I haven't had to use it straight away, which has been wonderful! So I've got used to it more because I just cried when it arrived... It's like that next step really, you know, the next step down."* (Participant 192)

With improved balance this participant was less fearful to mobilise and found that since wearing the textured insoles she did not have to use her new three-wheeled walker, due to the psychological benefit. In her view, using the walker represented a further progression of her symptoms. The fact that she has not

had to use it had improved her mood, which may be part of the “*whole thing*” with regard to her improved demeanor. Another participant also described a perceived improvement in balance: “*I found them better cos I didn’t wobble so much.*” (Participant 170, female, 60 years old)

The third participant who experienced a benefit from the textured insoles could not articulate why she liked wearing them but did not want to stop using them at the end of the study. She said she had been wearing them constantly in her work shoes except for one occasion when she removed them to see what it felt like.

*“When, when did I take them out? I think I took them out to see a) if I could notice and b) was there any difference and I was like I don’t like not having these in... And I was like why [did she miss the insoles] and I couldn’t get my head round, because then I put them straight back in; [partner’s name] was looking at me like “what are you doing, you’ve just taken them out?” and I said I know, they’re going back in now. But I don’t know, I think because I’ve worn them now and they’re always in my work shoes I don’t put them in any other, I just keep them in these... I can feel I haven’t got them in but not badly [when wearing other shoes without the insoles]. I can just feel that I haven’t got... it’s weird.”* (Participant 175, female, 32 years old)

The fourth participant to describe a specific benefit discussed two aspects of his symptoms, circulation and mobility. He had stopped wearing the insoles at the end of the intervention period because he thought he had to return them to the research team when in fact he could have kept them if he had wished to. He had gone back to wearing his normal gel insoles but explained that he felt the textured insoles had improved his foot control during walking, the circulation in his feet and general awareness of his feet.

*“I’ve got insoles on now but they’re the gel ones that I’m wearing at the moment... (Interviewer: So if you were choosing to buy one it would be a gel insole?) Normally, yeah. To be quite honest I have been thinking about going back to them [the textured insoles] and buying some, you know, and just give it another try because it did improve me circulation ‘cos I’ve got poor circulation in the right leg... It’s the gel insoles I’m wearing now, but that [poor circulation] seemed to ease off a lot when I was wearing the textured ones...”* (Participant 131, male, 64 years old)

Not all participants perceived the textured insoles to be effective. Two participants did not report any perceived change in balance or mobility, making distinct comments to this effect.

*“As far as I was concerned, in terms of making any difference to my balance, no. In terms of making a difference to how little or further I could walk, no. Didn’t notice any difference... No, I didn’t find they made a lot of difference at all either way; they weren’t, there was no disadvantage or advantage.”* (Participant 150, female, 57 years old)

*“I don’t think I had any benefit, I couldn’t see any benefit myself, because I’m not wearing them now and I don’t see any difference now.”* (Participant 159, female, 47 years old)

These comments demonstrate the individuality of the response to the textured insoles, which continued into the theme of insole comfort.

#### *Comfort of insoles:*

Participants responded individually with regard to how comfortable they found the insoles and how quickly they acclimatised to wearing them: *"I mean, when I first, when I used them the first time it was just a bit, oh, they're a bit weird, um, but now, um, but no, I don't even notice them now."* (Participant 192)

Others did not acclimatize at all: *"Initially they were uncomfortable when I first started wearing them, which I expected them to be, but I expected them to get a bit easier but I don't think they did."* (Participant 131)

In one particular case a participant became more aware of her insoles the longer she wore them: *"It was, as I say, as it went on, the bobbles on them, I started to be more aware of them."* (Participant 150)

One participant found the insoles very uncomfortable and said that they caused pins and needles sensations in her feet that she did not like. She also described problems trying to wear the insoles with socks. These problems would have caused her to stop wearing the insoles had she not been part of a study but she continued to wear them for the duration of the study to facilitate the research. Once the study came to an end she stopped using the insoles immediately.

*"It felt, you know if you've been on your feet all day and you've got, like, pins and needles in your feet – that's what it felt like all the time to me. And I think a lot of it as well was, because I can't move the toes in my right foot very well as I was putting my shoes and socks, my feet into my shoes, it [the insole] was grabbing the sock and making the sock very tight and it was that feeling that I didn't like."* (Participant 159)

This contrasted with another participant from the textured insoles group who said that she felt the insoles were more tolerable with socks because she could not feel the texture as much.

*"I have to say, sometimes quite uncomfortable. Because I got mine when it was fairly warm weather so it wasn't sort of socks or tights time, you know. So I wore them with a lot of my shoes, I mean most of my shoes are flat, without socks or tights or whatever... When the weather got cooler and I was wearing socks it wasn't so bad."* (Participant 150)

The insoles were not described as painful by participants other than number 159. One participant expressed that the insoles were not comfortable but specifically stated that they were not painful.

*"I think for the full duration they were still that, I mean not uncomfortable painful but just uncomfortable, a little bit."* (Participant 131)

This was a repeated theme with the participants, they experienced discomfort but not to the point where it caused pain. Participant 192, who experienced substantial benefit to her balance and confidence, stated

that initially the insoles were not comfortable until she got used to them. However, she acclimatised to the texture so the feeling of discomfort reduced. One participant noted that the insoles made some of their shoes too tight and perceived tighter shoes as a source of discomfort, stating that they would avoid wearing the insoles in certain shoes to prevent discomfort due to tightness: *"Depended on shoe tightness. Fine in loose shoes."* (participant 131).

The variation in severity of participants' MS symptoms from day to day influenced how much they could feel the insoles; on "bad days" some participants were more aware of the insoles, to the point where they became too uncomfortable to wear.

*"It came and went, yeah, it came and went with me symptoms I mean, I have a problem with me right foot anyway that I get burning in that foot quite a lot, err, and that's on and off so probably when that was burning, it emphasized it [the discomfort] even more to be fair."* (Participant 150)

Fatigue caused participants' experience of the insoles to change, with one female participant saying that she was only aware of the insoles when she was tired. At other times this participant only knew she was wearing the insoles, having placed them in her shoes, not because she could feel them against her feet.

*"When I'm tired [she can feel her insoles]. If I'm not tired then I know they're in there cos I don't take them out but I don't think, ooh, I've got them in today. You just put your shoes on and go to work. But when I'm tired, that's when I think... [I'm wearing the insoles]"* (Participant 175)

Insole comfort was a factor in participants' decisions regarding continued use. One participant would be prepared to take part in similar research in the future but would not like to wear the textured insoles again because they were uncomfortable for her.

*"It was interesting and it certainly made me think well, if I ever got asked to do it again I'd probably say to them [the researchers], look, can I not have the bobbly ones!"* (Participant 150)

Although some of the participants found the insoles uncomfortable, comfort was not the only consideration that participants took into account. Participant 131 did not find the textured insoles comfortable but he was willing to try wearing them again because he perceived them to be beneficial whereas participant 159, who also found the insoles uncomfortable, did not perceive any benefit so was not prepared to continue wearing the insoles beyond the study. Participants' perception of benefit may outweigh their experience of discomfort when deciding whether to continue wearing the insoles.

#### *Awareness of feet/legs:*

Textured insoles are proposed to increase afferent sensory input from the feet, as a means to improve balance and mobility. The experience of the participants in this study supports this hypothesis because they described being more aware of their feet. Participant 175 reported that the textured insoles made her more conscious of the feel of her feet and how she placed them when walking.

*"I think I'm more conscious, and I know I should be anyway when I'm walking but I think because there's something triggering me to say, right, you can feel them now, you can feel them more..."* (participant 175).

Participant 131 reported similar perceptions, that he was more aware of his foot position and able to lift his feet more when wearing the textured insoles. In this case an increase in sensory input appeared to improve control of the lower limb, which may lead to improvements in mobility.

*"Well, it was kind of, I think I was walking a bit better, picking me feet up better 'cos I was aware of it being there. So I was aware that I had the insoles on and it seemed to improve it, even, you know, like me toes were opening up a bit more so it was, yeah, it was getting better"* (participant 131).

## Discussion

Textured insoles have been trialed as an intervention to improve the balance and walking in people with MS by increasing stimulation to the soles of their feet, thus overcoming a reduction in plantar sensation caused by the physiological process of the disease. However, the experiences of people wearing textured insoles have not been examined. Considering that patient perception of an intervention has a part to play in its acceptance it is important to assess patient experiences as well as objective measures of function (Costello *et al.*, 2008; Bulley *et al.*, 2014). The aim of this study was to understand the experiences of people with MS who wore textured insoles. It showed that each participant had a different experience of the insoles and whilst some found the insoles beneficial, other did not. The benefits reported were to mobility confidence, foot position awareness and comfort. The response to this intervention appears to be individual and in the cases where a benefit was perceived there is the potential for these to be incorporated into a rehabilitation programme.

Some participants reported increases in mobility confidence when wearing the insoles. Whether this was due to true physiological effects on the neuromuscular control of the lower limb and posture or to a placebo effect because of the belief that the insoles would be beneficial cannot be determined from these results. However, what is evident is that some participants' experience of their mobility and mobilising changed for the better when they were wearing the insoles. Not all participants who experienced improved mobility confidence reported an actual change in their mobility but this did not appear necessary for the beneficial effects of greater confidence to occur. A similar observation was made by Mostert and Kesselring (2002) in their study of short term exercise training for aerobic fitness in people with MS, who found that patients' perception of their health improvements were greater than what might be expected from objective measures of aerobic capacity.

Whilst no one reported that they perceived a negative effect of the insoles some said that they felt no beneficial change to their perceived ability, so participants' responses to the insoles were clearly individual phenomena.

Some participants reported feeling more aware of their foot position, and explained that they liked this feeling. Increased awareness of their foot position might have helped to generate greater mobility

confidence because participants felt more in control of where they put their feet; this process was described clearly by one participant and alluded to by another. The report of greater foot awareness adds weight to the hypothesis that textured insoles might benefit patients with reduced plantar sensation by increasing afferent sensory input. Having participants describe that they are more aware of their feet implies that they are receiving more sensory feedback from them. In this way qualitative data can enhance quantitative data regarding functional performance when wearing textured insoles. However, again, this was an individual phenomenon that was not described by all participants. Some participants actually found the insoles uncomfortable and stopped wearing them for this reason at the end of the study.

Those participants who perceived a benefit from the insoles were willing to continue wearing them after the end of the study, whilst those who did not chose to stop wearing the insoles. A perception of benefit outweighed perceived comfort as a motivation to continue wearing the insoles. The same was also found by Bulley *et al.* (2014) in their study of the experiences of people with MS wearing AFO or FES as interventions for foot drop. In their work, they showed that participants perceived negative aspects of both interventions. However, participants were willing to persevere with the interventions when they felt that the limitations were outweighed by the benefits. It is clearly important to assess the perception of benefit of an intervention by the patient population to be able to assess how it will be accepted in use.

The subjective perceptions of benefit described by some participants could help to facilitate rehabilitation programme for those individuals. With increased mobility confidence participants may be more willing to try activity based rehabilitation programmes, with knock-on positive effects on their general fitness that may further help to alleviate symptoms of their condition (Rietberg *et al.*, 2004; White and Dressendorfer, 2004; Snook and Motl, 2009; Pilutti *et al.*, 2013). Greater awareness of foot position may enable more precise and effective performance of prescribed exercises to improve neuromuscular control and strength. If participants found the textured insoles comfortable their experience of exercise programmes would be enhanced generally. The results of this study suggest that, although it seems unlikely that all people with MS would benefit from the use of textured insoles in therapeutic programmes, those who do experience positive effects could find a substantial benefit.

#### *Limitations and future work:*

The improvement in mobility confidence described by some participants may have resulted in them being more willing to mobilise and, thus, becoming more physically active, consciously or subconsciously. The use of activity monitors could have provided information about participants' activity levels and any changes in activity as a result of wearing the textured insoles and would be a useful thing to consider for future studies.

Participants' perceptions of the insoles may have been influenced by the fact that they were being trialed as an intervention in a clinical study, so may have been automatically believed to be of benefit. This may account for some of the perceived benefits during the study. Participants may have altered their

behaviour because they were part of a clinical study, a phenomenon known as the Hawthorne effect (Adair, 1984; De Amici *et al.*, 2000; McCarney *et al.*, 2007).

The participants used in this study were taken from a larger group involved in a study of the objective effects of textured insoles on balance and walking. The overall group of participants was selected based on inclusion and exclusion criteria necessary for the quantitative study; therefore, the participant group used in the qualitative study reported here does not represent the general population of people with MS. This might mean that a certain perspective is given in the results that may have been different had a wider group of people with MS been sampled from. There was a lot of variability between participant experiences in the current study and without further work including a greater sample of the population of people with MS it cannot be clarified if this variability would continue to be seen or whether a more general trend of experience would emerge. It is likely that more participants would have had to be included to reach data saturation if they had not been selected from a pre-identified group.

#### *Clinical implications:*

Although from the results of this study it cannot be concluded that textured insoles would benefit everyone suffering from MS, some of the participants in this study reported perceived benefits that may be able to facilitate physiotherapy based rehabilitation programmes. It may be useful for clinicians to be aware of the possibilities of textured insoles so that they might offer them as a rehabilitation aid for patients who they think may benefit.

### **Conclusion**

Wearing textured insoles may help improve mobility confidence, foot comfort and and awareness of foot position for some people with MS. These benefits could be utilised as clinical tools when rehabilitating people with MS. Perception of benefit was more likely to encourage continued engagement with the insoles compared to their perceived comfort. However, participants in this study reported individual, varied experiences of wearing textured insoles and not all participants experienced benefits. Benefits to perceived well being and mobility confidence might be overlooked if the subjective experiences of wearing textured insoles are not investigated. Given the inconsistency of participant experiences, further research is needed to determine which factors are most important to consider when predicting participant benefit from the use of textured insoles.

## **List Of Abbreviations**

MS – Multiple Sclerosis

IPA – Interpretive Phenomenological Analysis

## **Declarations**

*Ethics approval and consent to participate:*

Ethical approval was obtained from the Teesside University School of Health & Social Care Research Governance and Ethics Committee (181/13) and Newcastle and North Tyneside 2 Research Ethics Committee (14/NE/0043). All participants consented voluntarily to take part having been given full information about the study and an opportunity to discuss what it would involve and how the data would be used.

*Consent for publication:*

All participants gave their written consent for anonymous transcript excerpts to be published at the time of consenting to take part in the study.

*Availability of data and material:*

N/A

*Competing interests:*

The authors declare they have no competing interests.

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*Author's contributions:*

Study conceptualised and designed by YJB and the Multiple Sclerosis Society grant applicants JD, DM, AH, KR, and PM.

YJB recruited participants, conducted interviews and focus groups, analysed the data and wrote up the report.

JD and DM supervised the work of YJB.

JD, DM, KR, PM and AH involved with securing funding for the work.

All authors read and approved the final manuscript.

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## References

- Adair JG. The Hawthorne effect: A reconsideration of the methodological artifact. *Journal of Applied Psychology*. 1984;69:334-345
- Angen MJ. Evaluating interpretive inquiry: Reviewing the validity debate and opening the dialogue. *Qualitative Health Research*. 2000;10:378-395
- Brocki JM, Wearden AJ. A critical evaluation of the use of interpretative phenomenological analysis (IPA) in health psychology. *Psychology and health*. 2006;21:87-108.
- Bulley C, Mercer TH, Hooper JE, Cowan P, Scott S, van der Linden ML. Experiences of functional electrical stimulation (FES) and ankle foot orthoses (AFOs) for foot drop in people with multiple sclerosis. *Disability and Rehabilitation Assistive Technology*. 2014; DOI:10.3109/17483107.2014.913713, ISSN 1748-3107 print/ISSN 1748-3115
- Caelli K. The changing face of phenomenological research: Traditional and American phenomenology in nursing. *Qualitative Health Research*. 2000;10:366-377.
- Citaker S, Gunduz AG, Guclu MB, Nazliel B, Irkec C, Kaya D. Relationship between foot sensation and standing balance in patients with multiple sclerosis. *Gait and Posture*. 2011;34:275-278.
- Costello K, Kennedy P, Scanzillo J. Recognising nonadherence in patients with multiple sclerosis and maintaining treatment adherence in the long term. *The Medscape Journal of Medicine*. 2008;10:225
- Curtis S, Gesler W, Smith G, Washburn S. Approaches to sampling and case selection in qualitative research: examples in the geography of health. *Social Science and Medicine*. 2000;50:1001-1014
- De Amici D, Klersy C, Ramajoli F, Brustia L, Politi P. Impact of the Hawthorne effect in a longitudinal clinical study: the case of anesthesia. *Controlled Clinical Trials*. 2000;21:103-114
- de Seze J, Borgel F, Brudon F. Patient perceptions of multiple sclerosis and its treatment. *Patient Preference and Adherence*. 2012;6:263-273
- Dixon J, Hatton AL, Robinson J, Gamesby-Iyayi H, Hodgson D, Rome K, Warnett R, Martin DJ. Effect of textured insoles on balance and gait in people with multiple sclerosis: an exploratory trial. *Physiotherapy*. 2014;100:142-149
- Dunne EA, Quayle E. The impact of iatrogenically acquired Hepatitis C infection on the well-being and relationships of a group of Irish women. *Journal of Health Psychology*. 2001;6:679-692
- Hatton AL, Dixon J, Martin D, Rome K. The effect of textured surfaces on postural stability and lower limb muscle activity. *Journal of Electromyography and Kinesiology*. 2009;19:957-964

Hatton AL, Dixon J, Rome K, Martin D. Standing on textured surfaces: effects on standing balance in healthy older adults. *Age and Ageing*. 2011;40:363-368

Hatton AL, Dixon J, Rome K, Newton JL, Martin D. Altering gait by way of stimulation of the plantar surface of the foot: the immediate effect of wearing textured insoles in older fallers. *Journal of Foot and Ankle Research*. 2012; <https://doi.org/10.1186/1757-1146-5-11>

Heesen C, Bohm J, Reich C, Kasper J, Goebel M, Gold SM. Patient perception of bodily functions in multiple sclerosis: gait and vision function are the most valuable. *Multiple Sclerosis*. 2008;14:988

Heidegger M. *Being and Time*. New York: State University of New York Press; 1996

Horsburgh D. Evaluation of qualitative research. *Journal of Clinical Nursing*. 2003;12:307-312

Jenkins ME, Almeida QL, Spaulding SJ, van Oostveen RB, Holmes JD, Johnson AM, Perry SD. Plantar cutaneous sensory stimulation improves single-limb support time, and EMG activation patterns among individuals with Parkinson's Disease. *Parkinsonism and Related Disorders*. 2009;15:697-702

Johnson KO. The roles and functions of cutaneous mechanoreceptors. *Current Opinion in Neurobiology*. 2001;11:455-461

Johnson R, Waterfield J. Making words count: the value of qualitative research. *Physiotherapy Research International*. 2004;9:121-131

Kalron A, Pasitselsky D, Greenberg-Abrahami M, Achiron A. Do textured insoles affect postural control and spatiotemporal parameters of gait and plantar sensation in people with multiple sclerosis?. *Physical Medicine and Rehabilitation*. 2015;7:17-25

Kavounoudias A, Roll R, Roll J. The plantar sole is a dynamometric map for human balance control. *Cognitive Neuroscience*. 1998;9:3247-3252

Kavounoudias A, Roll R, Roll J-P. Foot sole and ankle muscle inputs contribute jointly to human erect posture regulation. *Journal of Physiology*. 2001;532:869-878

Kelleher KJ, Spence WD, Solomonidis S, Apatsidis D. The effect of textured insoles on gait patterns of people with multiple sclerosis. *Gait and Posture*. 2010;32:67-71

Kennedy PM, Inglis JT. Distribution and behaviour of glabrous cutaneous receptors in the human foot sole. *Journal of Physiology*. 2002;538:995-1002

Kitzinger J. Introducing focus groups. *British Medical Journal*. 1995;311:299-302

Krefting L. Rigor in qualitative research: the assessment of trustworthiness. *The American Journal of Occupational Therapy*. 1991;45:214-222

- Krueger RA. Focus groups. A practical guide for applied research, London:SAGE; 1994
- McAuley E, Motl RW, Morris KS, Hu L, Doerksen SE. Enhancing physical activity adherence and well-being in multiple sclerosis: a randomised controlled trial. *Multiple Sclerosis*. 2007;13:652-659
- McCarney R, Warner J, Iliffe S, van Haselen R, Griffin M, Fisher P. The Hawthorne effect; a randomised controlled trial. *BMC Medical Research Methodology*. 2007; doi:10.1186/1471-2288-7-30
- Mostert S, Kesselring J. Effects of a short-term exercise training program on aerobic fitness, fatigue, health perception and activity level of subjects with multiple sclerosis. *Multiple Sclerosis*. 2002;8:161-168
- Morse JM. Validity by committee. *Qualitative Health Research*. 1998;8:443-445
- Perry SD, Radtke A, McIlroy WE, Fernie GR, Maki BE. Efficacy and effectiveness of a balance-enhancing insole. *The Journals of Gerontology*. 2008;63A:595-602.
- Pilutti LA, Greenlee TA, Motl RW, Nickrent MS, Petruzzello SJ. Effects of exercise training in fatigue in multiple sclerosis: A meta-analysis. *Psychosomatic Medicine*. 2013;75:575-580
- Powell RA, Single HM. Focus Groups. *International Journal for Quality in Health Care*, 1996;8:499.
- Reitberg MB, Brooks D, Uitdehaag BMJ, Kwakkel G. Exercise therapy for multiple sclerosis (review), *Cochrane Database of Systematic Reviews*, 2004;3; Art. No.: CD003980. DOI: 10.1002/14651858.CD003980.pub2.
- Sim J. Collecting and analyzing qualitative data: issues raised by the focus group. *Journal of Advancing Nursing*. 1998;28:345-352
- Smith JA. Reflecting on the development of interpretive phenomenological analysis and its contribution to qualitative research in psychology. *Qualitative Research in Psychology*. 2004;1:39-54
- Smith JA, Flowers P, Larkin M. *Interpretive Phenomenological Analysis: Theory, Method and Research*. 1st ed. London: SAGE Publications Ltd.; 2009
- Snook EM, Motl RW. Effect of exercise training on walking mobility in multiple sclerosis: a meta-analysis, *Neurorehabilitation and Neural Repair*, 2009;23:108-116
- Tomkins L, Eatough V. Reflecting on the use of IPA with focus groups: Pitfalls and potentials. *Qualitative Research in Psychology*. 2010;7:244-262
- White LJ, Dressendorfer RH. Exercise and Multiple Sclerosis, *Sports Medicine*, 2004;34:1077-1100

## Tables

Table 1: Questions followed during interviews.

Number	Content
1	How often did you wear the insoles?
2	Were you aware that you were wearing the insoles?
3	Would you wear the insoles again - if so, why?
4	Did they have any effect on your ability to get about?
5	How comfortable were they?

Table 2: Topic guide for focus groups.

Topic	Introductory question
Benefit of the insoles	Did you feel the insoles had a positive or negative effect on your balance and mobility?
Comfort of the insoles	How comfortable were the insoles?
Textured insoles as an intervention for MS	Do you think that textured insoles are useful tools in the management of multiple sclerosis?

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