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RESEARCH ARTICLE

Perceptions of arthritis glove wear of patients with rheumatoid arthritis and persistent hand pain: A nested questionnaire study within the A-Gloves trial

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Abstract

Introduction: Arthritis gloves are prescribed in rheumatoid arthritis (RA) to reduce hand pain, stiffness, and improve hand function. As part of a randomised controlled trial, this study investigated participants' perceptions of wearing arthritis gloves.

Method: Participants with RA and persistent hand pain (n = 206) were randomly assigned and prescribed either loose-fitting gloves (control) or arthritis gloves (intervention), for day and/or night wear (as per individual need). At 12-weeks, the trial follow-up questionnaire also included items about whether the gloves prescribed were: beneficial or not; if yes, the benefits experienced; any problems encountered; if they stopped wearing gloves day and/or night, and why.

Results: The questionnaire response rate was 154/206 (75%). In both groups, 73% reported gloves were beneficial (p = 0.97). There were no differences in types of benefits reported. The most common were: warmth (59% control: 54% intervention; p = 0.53); and comfort (54%: 62%; p = 0.29). Fewer reported problems with glove wear in the control group (33%), compared to the intervention group (49%); p = 0.05. In both groups, the most common daytime problem was inability to wear gloves for wet or dirty activities; and at night, gloves being too hot. Similar numbers in the control and intervention groups stopped wearing gloves either day or night (23%: 31%; p = 0.26), primarily for these reasons.

Discussion: Participants' perceptions about wearing arthritis or loose-fitting gloves were very similar. Wearing ordinary gloves could result in similar perceived benefits to arthritis gloves.

KEYWORDS

arthritis, gloves, hand, hand function, hand pain, hand stiffness, orthoses

1 | BACKGROUND

Rheumatoid arthritis (RA) causes hand pain, swelling, stiffness, paraesthesia, and muscle weakness (Horsten et al., 2010). Early use of disease modifying anti-rheumatic drugs has led to improved hand symptom control. However, at 1-year post-diagnosis a fifth of patients with RA still experience high levels of hand pain during hand activity, and at rest, with women experiencing more pain than men (Thyberg et al., 2017). Hand pain in the day can cause difficulty with hand function in everyday activities, work, and leisure. Night hand pain can disrupt sleep, and morning stiffness cause difficulties on rising with self-care and daily activities. A systematic review identified hand pain intensity, disease activity and hand strength as key factors influencing hand function (Arab Alkabeya et al., 2019). At 8-years post-diagnosis, almost 40% continue with persistent disease (i.e., no remission), including in the hands, despite earlier and aggressive treatment (Svensson et al., 2016); with worse hand function associated with greater pain intensity, higher disease activity, and poorer finger flexion and pinch grip (Bremander et al., 2019).

For over 40 years, arthritis gloves (also called compression, pressure gradient, stretch or therapy gloves) have been prescribed by occupational therapists, physiotherapists, and specialist nurses to reduce hand symptoms in people with RA, as well as in other hand conditions, for example, hand osteoarthritis (Swezey et al., 1979). Arthritis gloves were initially prescribed for night wear to reduce nocturnal hand pain and morning stiffness (McKnight & Kwoh, 1992). More recently, they have also been prescribed for daywear to help reduce hand pain, swelling, stiffness and improve hand function (Hammond & Prior, 2022). A wide variety of arthritis gloves are commercially available and many with hand arthritis buy such gloves themselves.

Arthritis gloves are usually made of nylon and Lycra® and should be a snug fit to apply pressure to the hand. The resulting pressure aims to reduce hand oedema and joint swelling, thus reducing hand pain and stiffness, and improving finger movement and hand function (McKnight & Kwoh, 1992; Oosterveld & Rasker, 1990). The warmth from glove wear also aims to reduce pain (Askari et al., 1974; Oosterveld & Rasker, 1990). There is inconclusive evidence from four small randomised controlled trials for the effectiveness of arthritis gloves in reducing nocturnal pain, morning stiffness and hand function when worn at night by people with RA with hand pain. No studies have addressed the effects of day-time wear (Hammond, Jones, & Prior, 2016).

A randomised controlled trial was subsequently conducted testing the effectiveness and cost-effectiveness of arthritis gloves worn during the day and/or night by people with RA and persistent hand pain. There were no significant differences in the effects of wearing an arthritis glove or a loose-fitting placebo glove (Hammond et al., 2021). When evaluating interventions, it is important to identify factors which may affect outcomes (Craig et al., 2008). Gaining participants' perspectives about an intervention can help understand why it may or may not be effective. Participants' perspectives about glove wear were investigated in two ways: through qualitative interviews with purposefully selected participants in both the intervention and control groups (Prior et al., 2022); and through structured and free text questions in the participant follow-up questionnaire, including all respondents. This article reports on the latter. The aim was to explore participates' perceptions about glove wear, in order to identify if key views in the interview study about glove wear were widely held, and potential reasons for the lack differences in hand symptom and function outcomes in the A-Gloves trial.

2 | METHOD

2.1 | Design and participants

The A-GLOVES trial was a pragmatic, parallel-group randomised controlled trial, conducted in 16 rheumatology occupational therapy departments in England and Scotland. Participants were recruited from Rheumatology out-patient clinics and occupational therapy departments. Inclusion criteria were adults diagnosed with RA or undifferentiated inflammatory arthritis (UIA) by a rheumatology consultant; with persistent pain in their fingers or metacarpophalangeal joints, and either: difficulty with hand function, for daytime glove wear; and/or difficulty sleeping due to hand symptoms for nightwear; and/or difficulty using their hands on rising due to early morning stiffness, for nightwear. Participants should not have previously worn gloves. Recruitment and all other trial procedures are detailed elsewhere (Hammond et al., 2021; Prior et al., 2017). Following consent, participants completed a baseline trial specific questionnaire. Following return, participants were randomly allocated to either the intervention or control groups and referred to occupational therapists for glove provision.

2.2 | Intervention and control groups

Participants were treated within 3 weeks of randomisation. The intervention group received snug-fitting Isotoner® arthritis gloves (www.Isotoner.com), as these are the most common provided in clinical practice in the UK (Hammond & Prior, 2022). These gloves applied pressure and provided warmth to the hand/s. As in previous trials of arthritis gloves, these were compared with control (placebo) gloves (Culic et al., 1979; Dixon et al., 1986; Oosterveld & Rasker, 1990; Swezey et al., 1979). The control group received purposefully loose-fitting Jobskin® oedema gloves (i.e., fitted one to two sizes too large), applying no pressure but still providing warmth (www.Jobskin.co.uk). The control gloves were selected by our patient and public involvement and engagement (PPIE) group as being credible alternatives to the intervention gloves. Prior to recruitment starting, trial therapists were trained in correct fitting of both types of gloves.

When fitting gloves, therapists discussed the appropriate wear regimen with each participant (i.e., day and/or night). Glove wear should start gradually for a few hours a day initially (even if a night wear regimen was recommended) to allow the hands to become accustomed to wearing these and to check for any problems. Gloves could then be worn for most of the day (either removed or covered with waterproof gloves for wet or dirty activities, and for hand hygiene), and/or all night if needed, but not to be worn continually 24 h a day. Gloves should be removed for short breaks during the day, and hand exercises performed. Participants were also provided with ergonomic (joint protection) and hand exercise training for up to 1 h, if needed. It was anticipated that most participants would not, as these are standard hand interventions in RA/UIA likely to already have been provided by occupational therapists and/or physiotherapists. All were provided with information booklets about these and reminded to regularly perform (Heine et al., 2012; Versus Arthritis. 2013). Therapists recorded provision of ergonomics and hand exercise booklets, and any training, in a trial treatment record. Gloves were reviewed within two to 4 weeks to identify if there were any problems with glove wear. The wear regimen could be changed if needed (e.g., from day and night to night only) and glove sizing changed if participants were experiencing problems with fit (i.e., gloves were too tight for either group, or too loose in the intervention group). Participants were asked to contact the therapist if they experienced any further problems. The two types of gloves are shown in Figures 1 and 2. The clinical protocols for intervention and control glove provision are described in detail elsewhere (Hammond, Jacklin, & Hough, 2016; Prior et al., 2017).

2.3 | Data collection

As gloves are intended to be worn in the longer-term, follow-up was at 12 weeks post-randomisation. This ensured participants had enough time to get used to regular glove wear, resolve any wear problems at review, contact their therapist if problems arose later, and be able to experience benefits during daily activities and/or at night, if any. Participants were mailed a second trial specific questionnaire to complete and return by post. As well as patient reported outcome measures, this included both closed and free text questions to identify participants' perceptions of the gloves received. These included:

- Whether they considered the arthritis gloves provided were of some or no benefit.
- If yes, to tick which of 22 possible benefits applied (Box 1).
- A free text box to describe any other benefits experienced, or any other comments about the gloves received.
- Did they have any problems wearing the gloves (yes/no)? If yes, to describe problems with day- and/or night-wear (free text boxes).
- Did they stop wearing the gloves completely (yes/no)? If yes, to describe why this was for: day-and/or night wear (free text boxes).
- Whether they would continue to wear the gloves received (yes/no)?

FIGURE 1 Intervention (Isotoner®) arthritis glove (intervention group)

FIGURE 2 Control Glove (loose-fitting Jobskin® classic oedema glove: control group)

- Whether they would consider purchasing arthritis gloves themselves in future (yes/no)?

The questionnaire also included items about their recommended glove wear regimen (day wear; night wear; or both) and the amount of time, within the last 4 weeks, that they had worn their gloves for day and/or night. Focussing on the last 4 weeks would be likely to reflect the amount of wear they found most useful (or tolerable). The items were designed with the help of the trial's PPIE and clinical expert advisory groups. Potential benefits were identified by: PPIE members describing benefits they, or others they knew, had experienced from glove wear; clinical experts' insights into patient feedback from glove wear; and reviewing results of an arthritis glove feasibility study of participants' reported benefits from glove wear (Hammond & Prior, 2021). The PPIE group reviewed drafts and advised on accessible language and wording of the booklet.

BOX 1 Statements regarding glove wear in the 12-week follow-up questionnaire

1. Hands feel less painful in the day
2. Hands feel less painful in the night
3. Hands feel less stiff
4. Gloves give comfort
5. Able to do things better—personal care/grooming
6. Able to do things better—household activities
7. Able to do things better—leisure/social activities
8. Able to do things better—at work
9. Stronger hands/wrists
10. Gloves give support
11. Hands feel less swollen
12. Gloves give warmth
13. Hand(s) feel more flexible
14. Using a keyboard (e.g., computer/laptop)
15. Using a tablet computer (e.g., i-Pad)
16. Using a mobile/smart phone
17. Sleep better
18. Take fewer painkillers
19. More confident doing activities
20. Less frustrated doing activities
21. Improved mood
22. Feel better overall

2.4 | Sample size

The sample recruited in the trial (n = 206) was determined by that required to detect differences in the primary outcome measure (i.e., hand pain during the day). The sample size for this nested questionnaire study was further restricted to those who responded at 12 weeks, who were provided with either the intervention or control gloves. Analysis is therefore exploratory.

2.5 | Data analysis

Descriptive statistics were used to summarise numerical data. Normality of data was tested using the Kolmogorov-Smirnov test and appropriate tests selected. Reliability of the 22 benefit items in the questionnaire was tested in two ways: internal consistency (Cronbach's alpha with a value ≥0.7 is consistent with group level use); and split-half reliability (with a Spearman–Brown coefficient ≥0.8 considered acceptable). To identify any differences between groups: glove wear duration was tested using Mann–Whitney U Tests; numbers wearing gloves for 8 h or more, numerical data on glove perceptions and provision of information booklets using Chi-square; and numbers of benefits reported using an unpaired t-test; with $p \leq 0.05$ considered significant.

Content analysis was used to analyse free text responses as these were generally brief, for example, glove problems might be reported as 'too hot'. Responses were typed up, read, and then coded (AH) into separate meaning statements (Bengtsson, 2016) until all relevant responses were identified for 'other benefits', problems with glove wear, and reasons for stopping glove wear. For 'other benefits', codes were checked against benefits already ticked by the participant, and not included again, if already reported. If any codes were identified in the incorrect section (e.g., 'other benefits' contained problems codes or vice versa), codes were changed to the relevant section. Statements were categorised by two researchers (AH, YP) to ensure confirmability (Bengtsson, 2016). Types of and frequencies of 'other benefits', problems experienced and reasons for stopping glove wear were reported in tables.

3 | RESULTS

Overall, 206 participants were recruited; with 103 randomly allocated to each group. The response rate for completing the questionnaire at 12 weeks was: control = 79/103 (77%); intervention = 84/103 (82%). However, amongst respondents in the control group, nine could not be provided with sufficiently loose-fitting oedema gloves due to their hand size. Demographic data and wear regimens for those respondents receiving gloves, and thus able to answer the glove perceptions questions (i.e., control n = 70; intervention n = 84) are in Table 1. Most were prescribed gloves for both hands: control n = 66/70 (94%); intervention n = 77/84 (92%). All received gloves for their dominant hand.

3.1 | Glove wear

The reported wear regimen at 12 weeks (day/night) is summarised in Table 1, with no significant difference in wear regimen (X^2 = 3.32; df = 2; p = 0.19). Half reported being recommended to wear gloves both day and night. There were no significant differences between groups in the amount of time that they reported wearing gloves in the previous 4 weeks, at on average 4 h/day and 7 h/night. Results for the dominant hand are reported (Table 2) and were similar for the non-dominant hand (data not shown). Some participants did not report wear duration.

3.2 | Provision of ergonomic and hand exercise booklets and training

Most participants received the information booklets: ergonomics, control 61/70 (87%); intervention = 77/84 (92%) (X^2 = 0.86; df = 1; p = 0.35); and hand exercise: control = 56/70 (80%); intervention 71/

TABLE 1 Characteristics of participants responding at 12-weeks who received gloves (n = 154)

	Control (n = 70)	Intervention (n = 84)
Age (years): median (IQR)	58.50 (51, 68.75)	61 (51.75, 67.50)
Sex: female (%)	58 (83%)	69 (82%)
Diagnosis		
RA	63 (90%)	74 (88%)
UIA	7 (10%)	10 (12%)
Hand dominance		
Right (%)	66 (94%)	77 (92%)
Left (%)	2 (3%)	2 (2%)
Both (%)	2 (3%)	5 (6%)
Employment status		
Retired	34 (49%)	40 (48%)
Employed	24 (33%)	32 (38%)
Long term sick leave	1 (1%)	4 (5%)
Unemployed	3 (4%)	2 (2%)
Homemaker	8 (12%)	6 (7%)
Diagnosis duration (years): median (IQR):	5 (1, 12.25)	4.13 (0.6, 14)
Early RA/UIA (≤2 years)	23 (33%)	36 (43%)
Established RA/UIA (2 years)	47 (67%)	48 (57%)
Medication regimen		
0 DMARDs	4 (6%)	7 (8%)
1 DMARD	28 (40%)	34 (40%)
2 or more DMARDs	27 (38%)	29 (35%)
Biologics	11 (16%)	14 (17%)
Gloves prescribed for		
Both hands	66 (94%)	77 (92%)
Dominant hand only	4 (6%)	7 (8%)
Glove wear regimen at 12 weeks		
Day only	9 (13%)	20 (24%)
Night only	19 (27%)	23 (27%)
Both day and night	42 (60%)	41 (49%)

Abbreviations: DMARD, disease modifying anti-rheumatic drug; IQR, inter-quartile range; RA, rheumatoid arthritis; UIA, undifferentiated inflammatory arthritis.

84 (84%) (X^2 = 0.11; df = 1; p = 0.74). Ergonomics and/or hand exercise training was provided to seven (10%: four ergonomics; six exercise) in the control and 10 (12%: four ergonomics; seven exercise) in the intervention groups.

3.3 | Glove benefits

Reliability of the 22 benefits items was good: internal consistency was α = 0.92; and split half reliability (Spearman–Brown coefficient) was 0.91. Gloves were perceived as beneficial by: control n = 51/70 (73%); intervention 61/84 (73%); X^2 = 0.001; df = 1; p = 0.97. As around half reported they were recommended to wear gloves day and night, and potentially there could be a carry-over effect of glove wear from day to night and vice versa, the numbers reporting each benefit were compared irrespective of wear regimen. Considering all participants' responses (n = 154), there were no significant differences in the numbers of participants reporting each benefit between the two groups. The most commonly reported benefits of glove wear, by over half in both groups, were warmth and comfort. The third and

TABLE 2 Duration and frequency of glove wear for the dominant hand: median (inter-quartile range)

Daytime wear regimen	Control $n = 51$	Intervention $n = 61$	p
Hours/day	4 (2.5, 6)	4 (2, 7.75)	0.88[a]
Missing	0	2	
No. wearing ≥8 h/day	9 (18%)	15 (25%)	0.38[b]
Night wear regimen	**Control $n = 61$**	**Intervention $n = 64$**	p
Hours/night	7 (4.5, 8)	7 (5, 8)	0.51[a]
Missing	1	1	
No. wearing ≥8 h/night	21 (34%)	17 (27%)	0.34[b]
No. wearing gloves for ≥8/24 h	**Control = 70**	**Intervention = 84**	
Missing	1	1	
	41 (59%)	38 (45%)	0.09[b]

[a]Mann–Whitney *U*-test.
[b]Chi-square test.

fourth most common glove benefits were similar in both groups: stiffness (third control; fourth intervention) and providing support (third intervention; fourth control), with no significant differences between groups for either (see Table 3). Amongst those reporting benefits, a similar number were reported in each group: control = 8.95 (SD 5.26); intervention = 8.98 (SD 4.91); $p = 0.97$.

3.4 | Glove problems

Significantly more in the intervention group reported problems with glove wear (whether during the day and/or night): control = 23/70 (33%); intervention = 41/84 (49%) ($X^2 = 4.00$; df = 1; $p = 0.05$). Numbers experiencing problems either day or night, and types of problems experienced (from the free text responses), are listed in Table 4. The most common daytime problem for both groups was being unable to wear gloves for some activities, especially if needing to regularly wash their hands, or hands got wet or dirty: control = 16%; intervention = 11%. For example,:

- 'In the kitchen they became wet/dirty when chopping veg etc same when baking. Have to take it on and off then, end up leaving it off to complete chores'. (Control participant).
- 'I was unable to do some of my daily tasks like washing dishes, bathing or taking a shower'. (Intervention participant).

The most common problem at night in both groups was gloves making the hands too warm, hot or sweaty, especially in warmer weather: control = 16%; intervention = 16%.

- 'They made my hands too hot and prevented me from sleeping so did not use them at night'. (Control participant).
- 'Hands got too hot during night'. (Intervention participant).

The intervention group reported a wider range of problems with glove wear during the day (see Table 4). Potentially, some of these could be attributed to pressure effects, that is, fingers/hands being numb, cold, more swollen, painful, circulation worse and feeling restricted.

3.5 | Stopping glove wear

At 12 weeks, glove wear was stopped day and/or night by: control = 16/70 (23%: 8 day; 16 night); intervention = 26/84 (31%: 11 day; 15 night) ($X^2 = 1.26$; df = 1; $p = 0.26$). Reasons for stopping glove wear are shown in Table 5, with the most common in the day being: not feeling any benefit (control) and interference with doing activities (intervention); and at night, for both groups, that their hands became too hot.

3.6 | Future use

Around three-quarters in both groups were willing to continue glove wear: control = 50/69 (72%); intervention = 59/82 (72%) ($X^2 = 0.005$; df = 1; $p = 0.94$). Around two-thirds would consider purchasing replacement gloves: control = 43/69 (62%); intervention = 54/81 (67%) ($X^2 = 0.31$; df = 1; $p = 0.58$). Some respondents did not answer these items.

4 | DISCUSSION

The aim of this study was to explore the A-Gloves trial participants' perceptions of wearing either correctly fitted Isotoner® arthritis gloves (providing both pressure and warmth), or purposefully loose-fitting oedema (control) gloves (providing warmth but no pressure). The A-Gloves trial identified no significant differences in hand outcomes between groups (Hammond et al., 2021). The questionnaire responses aided understanding of why this was, as benefits from glove wear were similarly reported,

TABLE 3 Participants' perceptions of benefits of arthritis glove wear (n = 154)

	Control n = 70	Intervention n = 84	p
Gloves give warmth	41 (59%)	45 (54%)	0.53
Gloves give comfort	38 (54%)	52 (62%)	0.29
Hands feel less stiff	38 (54%)	37 (44%)	0.21
Gloves give support	32 (46%)	49 (58%)	0.12
Hands feel less painful in the night	31 (44%)	37 (44%)	0.98
Hands feel less swollen	29 (41%)	34 (41%)	0.91
Hands feel less painful in the day	28 (40%)	44 (52%)	0.13
Hands feel more flexible	27 (39%)	21 (25%)	0.06
Sleep better	21 (30%)	25 (30%)	0.97
Able to do things better- household activities[a]	21 (30%)	18 (21%)	0.22
Feel better overall	21 (30%)	25 (30%)	0.97
Take fewer painkillers	19 (27%)	15 (18%)	0.17
Less frustrated doing activities	15 (21%)	20 (24%)	0.73
Improved mood	14 (20%)	19 (23%)	0.69
Able to do things better- leisure/social activities[a]	12 (17%)	13 (16%)	0.78
Using a mobile/smart phone	12 (17%)	11 (13%)	0.48
Able to do things better- personal care/grooming[a]	11 (16%)	12 (14%)	0.80
Stronger hands/wrists	10 (14%)	21 (25%)	0.10
More confident doing activities	10 (14%)	17 (20%)	0.33
Using a keyboard (e.g., computer/laptop)	10 (14%)	13 (16%)	0.84
Able to do things better-at work[a,b]	3 (14%)	9 (28%)	0.18
Using a tablet computer (e.g., i-Pad)	8 (11%)	10 (12%)	0.93
Reported benefits in one or more activity options[a]	24 (34%)	27 (32%)	0.78
Other benefits (free text responses)			
Hands felt better	5 (7%)	5 (6%)	
Other (i.e., relieved throbbing; better blood flow to fingers)	2 (3%)		

[a]Reported benefits in one or more activity options.

[b]Only those stating at work (n = 24 control group; n = 32 intervention group).

to a greater or lesser extent, irrespective of the type of glove prescribed.

In the trial outcome measures, both groups reported similar small improvements in dominant hand pain (day and night) and hand stiffness, at around or slightly above these measures' minimal clinically important differences (MCID). In this study, between 40% and 54% in both groups reported benefits of their hands feeling either less painful (day/night) and/or stiff, reflecting why there were similar levels of improvements in these hand outcomes in the trial. One reason for glove provision at night is to help reduce sleep disruption due to nocturnal pain, yet only a third in both groups thought gloves helped them sleep better. Prior to this study (apart from the interview study associated with the trial [Prior et al., 2022]), only two small (n = 24) randomised controlled trials had anecdotally reported participants' views of night-time wear of arthritis gloves, that is, that glove wear improved wellbeing (Culic et al., 1979); protected hands from being compressed in the natural movements of sleep, and that hand activities were easier after gloves were removed (Dixon et al., 1986). The trial hand function measures only slightly improved in both groups (i.e., less than the: MDC score for the Measure of Activity Performance of the Hand [Prior et al., 2018]; and MCID for the Michigan Hand Questionnaire [Chung et al., 1998]). Only a third in both groups reported benefits of being able to do a variety of activities better as a result of day and/or night wear, reflecting why there were only slight hand function improvements in both groups. Despite the small improvements in hand symptoms and function from wearing either type of glove, most considered glove wear beneficial, irrespective of which glove was prescribed, with over half reporting benefits from the warmth and comfort provided, and other benefits being reported, to a greater or lesser extent, similarly by both groups.

TABLE 4 Problems reported from glove wear during the day or night: frequencies and free text responses

	Daytime wear regimen		Night-time wear regimen	
Recommended wear regimen at 12 weeks	**Control (n = 70) 51 (73%)**	**Intervention (n = 84) 61 (73%)**	**Control (n = 70) 61 (87%)**	**Intervention (n = 84) 64 (76%)**
No. participants reporting problems	19 (37%)	27 (45%)	15 (25%)	21 (33%)
No. problems reported in total	21	38	18	24
Problems				
Unable to wear for some activities (e.g., wet, dirty, cooking, needing to regularly handwash, crafts)	8 (16%)	7 (11%)	n/a	n/a
Gloves made hands too warm/hot/sweaty	3 (6%)	7 (11%)	10 (16%)	10 (16%)
Pressure issues (circulation worse, fingers cold, or numb)	1 (2%)	6 (10%)	1 (2%)	2 (3%)
Hands more painful	0	4 (7%)	2 (3%)	4 (6%)
Irritating/itchy to wear	0	4 (7%)	2 (3%)	3 (5%)
Hands clumsy/restricted/uncomfortable	0	3 (5%)	1 (2%)	2 (3%)
Hands/fingers became swollen	0	2 (3%)	1 (2%)	2 (3%)
'Glad to get them off'	1 (2%)	0	-	-
Suffer cramp a lot in hands	-	-	1 (2%)	0
Stiffness worse	-	-	0	1 (2%)
Glove design issues (day or night wear)	8 (16%)	6 (10%)	-	-
Slippy when picking up/driving	3	1	-	-
Not like appearance	3	2	-	-
Dirty quickly	1	0	-	-
Not wash well	0	1	-	-
Problems getting on/off	1	1	-	-
Poor quality stitching	0	1	-	-

TABLE 5 Participants stopping glove wear: frequency; and reasons (from free text responses)

	Daytime wear regimen		Night-time wear regimen	
Recommended wear regimen: n	**Control (n = 70) n = 51**	**Intervention (n = 84) n = 61**	**Control (n = 70) n = 61**	**Intervention (n = 84) n = 64**
No. participants stopping glove wear	8 (16%)	11 (18%)	16 (26%)	15 (23%)
Reasons				
Gloves made hands too warm/hot/sweaty	0	1	8	5
Unable to wear for some activities (e.g., wet, dirty, cooking, needing to regularly handwash, crafts)	0	5	n/a	n/a
Felt no benefit	4	0	2	1
Hands were worse wearing gloves	0	1	1	4
Told to stop wearing/received steroid injection	1	1	3	0
Gloves uncomfortable/irritating	0	0	1	3
No longer thought needed gloves	2	0	0	0
Hands colder than normal	0	2	0	0
Never worn the gloves	0	1	0	0
Kept trying [*but stopped wearing*]	1	0	1	0

The questionnaire responses supported the findings of the in-depth interviews. In these, participants from both groups reported what they liked most was the warmth provided by gloves. They attributed any benefits to the warmth effect. Whilst warmth helped ease joints and stiffness, and joints felt looser, warmth was perceived as having only a limited effect on hand pain (day or night) or hand function and provided benefit only whilst gloves were being worn as symptoms soon returned when gloves were removed (Prior et al., 2022). The interview and questionnaire responses both indicate that warmth from glove wear is what participants found valuable, whichever type of glove they received. Participants in both groups also liked the feelings of comfort, less hand stiffness (potentially due to warmth from glove wear) and support. Participants in the A-Gloves interviews perceived them as ordinary gloves, rather than a medical device (Prior et al., 2022).

Both groups reported wearing the gloves prescribed for similar amounts of time, that is, around 4 h in the day and/or 7 h at night. There is no published evidence about how long gloves should be worn to gain any potential benefits. Several patient and public facing websites, including advice for people with hand arthritis, recommend that arthritis glove wear should follow the 'eight-hour rule', although the basis for this is not stated (Bradley & Zoeliner, 2022; Chaney, 2018; Donvito, 2018; Hegg, 2017; Menard, 2021). This seems to refer to wearing gloves for at least 8 h continually during the day, and/or 8 h during the night. One website states that gloves are designed to be worn 'for about the length of time you sleep' (i.e. around seven to 8 h for most people) (Zelman, 2020). Participants in the trial were not specifically told to wear the gloves for at least 8 h during the day and/or at night, as there was no evidence available to support these instructions. The treating therapists advised about glove wear duration in line with current clinical practice, that is, that they could be worn for most of the day and/or all night, as needed to help with hand symptom relief and to perform activities in the day, but not to wear continuously (Hammond & Prior, 2022); and through discussion with each participant, as to what they considered individually feasible. In both groups, less than a quarter of participants reported wearing gloves for 8 h or more a day; and only a third for 8 h or more at night, although around half were able to wear gloves for 7 h or more at night (reflecting perhaps the amount of time they would normally spend in bed). Fewer than half in the intervention group reported wearing gloves cumulatively for at least 8 h, on average, within 24 h, although more in the control group were able to do so. Other websites provide differing advice, that gloves should be worn when the person experiences hand pain, swelling and/or stiffness, to help with activities during the day, as well as whilst asleep (St. George's University Hospitals NHS Foundation Trust, 2020; Watson, 2022).

Problems with glove wear were common in both groups, with significantly more in the intervention group reporting these, despite having a glove review appointment with a therapist. A quarter in both groups changed their wear regimen as a result, that is, stopping either day or night wear. Such problems affected how long participants were either willing and/or able to wear gloves. Why participants in both groups experienced problems were often similar, for example, having to remove gloves too often for wet activities in the day, or being too hot at night. Most problems were either practical or due to discomfort, although there were more problems reported by the intervention group that could potentially be attributed to pressure from the gloves. A quarter of both groups reported gloves were not beneficial. Two previous arthritis glove trials also reported participants' experienced problems at night of: arthritis gloves being too hot, itchy, difficult to get on and off, and gloves coming off in the night (McKnight & Kwoh, 1992; Oosterveld & Rasker, 1990).

Finally, it is unlikely that the similar improvements in hand pain and stiffness in both groups were attributable to hand exercises, rather than glove wear, as most participants only received verbal and written reminders to perform these. Most were not provided with training, as they had already received this. For those who did, it was provided in one session, reflecting clinical practice as, typically, therapists providing hand exercises alongside glove provision do so in 12 (SD 6) minutes (Hammond & Prior, 2022). A systematic review identified that those hand exercise programmes which have demonstrated improved hand symptoms and hand function consist of intensive resistance exercises (i.e., four to six light progressing to medium resistance exercises using therapeutic putty, each repeated at least 10 times daily). Programmes were taught in several weekly therapist-supervised sessions using cognitive-behaviour approaches to increase adherence with home hand exercise programmes (Hammond & Prior, 2016). Participants did not receive such training. It is unlikely that verbal and written reminders led to most participants increasing their home hand exercise programme to the extent required to cause changes in pain and stiffness observed in the trial. If they had, significant improvements in hand function in both groups would also likely have resulted, which did not occur.

4.1 | Strengths and limitations of the study

A strength of this study was it being the largest to date investigating trial participants' views of arthritis gloves compared to control (placebo) gloves. The trial was described to participants as comparing two types of arthritis glove, and recruited participants naïve to arthritis glove wear, to reduce the possibility that the control group might consider they were 'only' receiving placebo gloves. Additionally, we developed questions with the help of our PPIE and clinical expert advisory group, to reflect patients' and therapists' experiences and research priorities. The potential benefit options were comprehensive, as participants added only a few other benefits in the free text boxes. A limitation was that a similar approach was not used to identifying problems with and reasons for stopping glove wear. A feasibility study identified eight potential problems, which were similar to those reported here, meaning that a list of potential problems could have been included (Hammond & Prior, 2021). Providing options, as well as the free text boxes, might have encouraged participants to further report any negative aspects of

glove wear. Whilst many participants indicated they would consider buying arthritis gloves in future, they were not informed of the likely costs of these (which vary considerably by supplier and manufacturer). For example, Isotoner gloves can cost between £26 and £35.70/pair commercially, dependent on where purchased. (Gloves are bulk purchased for considerably less by the NHS, but only the first pair is normally provided. Thereafter patients usually need to purchase these themselves). Furthermore, this is a recurrent cost as arthritis gloves need replacing every four to 6 months. Personal financial constraints might have altered people's willingness to pay and wear arthritis gloves in future. Additionally, the sample size for the A-Gloves trial was based on detecting differences in the primary outcome measure. For this study, the sample size was further constrained to the numbers of people provided with either intervention or control gloves who responded at 12 weeks. Accordingly, there may be a risk of Type II errors, and these results can be considered as exploratory.

4.2 | Implications for clinical practice and people with hand inflammatory arthritis

Prior to this trial, there was little research evidence to inform decisions about arthritis glove provision, as the effects on hand pain, stiffness, and function were not elucidated. As a result, therapists' decision-making was primarily influenced by information from training courses, colleagues, and patient feedback (Hammond & Prior, 2022). Several unpublished arthritis glove audits by therapists were identified, reporting patient feedback about arthritis glove wear was generally good. This trial similarly identified that participants reported benefits from arthritis glove wear. What was striking was that the frequency and types of benefits reported by those wearing loose-fitting gloves were almost the same as those wearing arthritis gloves. Accordingly, therapists should question the relevance of providing arthritis gloves applying pressure and warmth to relieve hand symptoms and improve function, when patients report that loose gloves providing warmth (but no pressure) have very similar effects. Warmth and comfort, the most important benefits for patients, could likely be achieved by wearing ordinary fingerless gloves. Loose-fitting oedema gloves (as worn by the control group) are unlikely to provide additional advantages over ordinary gloves. Therapists could therefore recommend to patients appropriate types of ordinary fingerless gloves to try, alongside continuing to provide ergonomic (joint protection) and hand exercise training.

Whilst this trial tested only one model of arthritis glove, the Isotoner, it is unlikely that other models would lead to different results. Isotoner arthritis gloves are more commonly prescribed in the NHS as therapists consider them of good quality (Hammond & Prior, 2022). There are many designs of arthritis glove available commercially. People with RA and other forms of hand arthritis can purchase these from High Street and online stores. The market for arthritis gloves is growing globally, due to an ageing population and more people with hand arthritis (www.researchnester.com, 2022). Arthritis websites containing arthritis glove reviews may make recommendations as to which to buy by assessing customers' reviews from manufacturers or major suppliers' websites, or from small panels of testers (e.g., Watson, 2022), rather than being based on research. It is important that people with hand arthritis are provided with evidence-based advice by health professionals when asked if arthritis gloves could be of help.

5 | CONCLUSION

In this study, similar benefits, and problems, were reported by participants wearing arthritis gloves and those wearing loose-fitting control gloves. Those wearing the latter reported fewer problems. Participants wearing either glove most often reported benefits to be warmth and comfort. The intervention group did not indicate additional benefit resulting from having gloves which exert pressure on their hands, and potentially this caused more problems for some. Given that the A-Gloves trial identified arthritis gloves were not effective (or cost-effective), wearing ordinary, lightweight fingerless gloves could provide such feelings of warmth and comfort instead. This warmth could also help with perceptions of reducing stiffness. Such gloves usually contain small amounts of Lycra to enable a closer glove fit, which could also provide the sensation of support that participants liked. Therapy services in the NHS would save money on orthotics budgets by stopping prescribing arthritis gloves. Patients with hand arthritis would also save money, as ordinary gloves could cost less and last longer than arthritis gloves, depending on choice. Future research could focus on what types of ordinary gloves are considered most helpful by people with hand arthritis, meeting their preferences for warmth and comfort, without being unduly hot.

AUTHOR CONTRIBUTIONS

Alison Hammond and Yeliz Prior led the study, analysed data and interpreted results. Alison Hammond completed the first draft of the manuscript. All authors contributed to, read, and approved the final manuscript.

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CONFLICT OF INTEREST

The authors have no conflicts of interest to report.

DATA AVAILABILITY STATEMENT

The data underlying this article will be shared on reasonable request to the corresponding author. All data relevant to the study are included in the article.

ETHICS STATEMENT

The trial was approved by the North of Scotland National Research Ethics Service Committee (REC reference 15/NS/0077) and the University of Salford School of Health Sciences Research, Innovation and Academic Engagement Ethical Approval Panel (HSCR 15-94). All participants provided written, informed consent.

TRIAL REGISTRATION

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