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HAND-Q: A global normative data sample of 1373 participants

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Summary *Introduction:* The HAND-Q is a condition-specific, patient-reported outcome measure assessing health-related quality of life and satisfaction in individuals with hand conditions. Normative data from a global healthy population would improve clinical and research interpretation. Therefore, we aimed to provide normative values for the four most important HAND-Q scales—appearance, function, life impact, and symptoms—capturing key physical and psychosocial aspects of hand health.
Methods: A web-based cross-sectional survey (August 1 to September 9, 2024) included healthy participants via the international Prolific platform and through convenience sampling, excluding individuals with hand conditions or trauma.
Results: A total of 1373 participants from 44 countries were included. Age (life impact p=0.002 and symptoms p=0.001), smoking status (appearance p=0.009, function p=0.007, and symptoms $p < 0.001$), skin type (appearance $p < 0.001$, life impact p=0.016, and symptoms p=0.002), and occupational factors showed significant associations with specific HAND-Q scales. Former smokers demonstrated incremental improvement in function (p=0.08) and life impact (p=0.018) scores with increasing time since cessation. No significant gender differences were observed.

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Conclusion: This study provides the first normative data for the HAND-Q scales obtained from a global population of healthy individuals. These reference values enhance the interpretability of HAND-Q scores and support their use in clinical and research settings to inform treatment planning and evaluate and interpret patient-centered outcomes.
Level of evidence: II

Hand and wrist conditions, including both traumatic injuries and chronic disorders, are common in the general population and lead to a considerable number of hospital and emergency department visits.[1,2] These injuries and conditions often result in functional limitations that impact essential daily tasks and occupational activities, underscoring the importance of effective treatment and rehabilitation. Despite conservative or surgical interventions, a significant portion of patients continue to experience pain, restricted movement, and other symptoms that affect their quality of life, social interactions, and psychological well-being on a daily basis.[3–12]

There is growing recognition among clinicians on the importance of incorporating patient perspectives in assessing treatment outcomes, particularly for surgical interventions.[13,14] This patient-centered approach seeks to enhance the quality of care by focusing on outcomes that matter the most to patients with hand-related conditions.[4,9,10] Patient-reported outcome measures (PROMs) have emerged as valuable, validated tools that capture these perspectives.[15] The HAND-Q, a recently developed condition-specific PROM,[16] was created through an international, multiphase study involving 1277 patients from six countries.[17] It encompasses four domains, divided into 14 scales, and is versatile across a broad range of hand and wrist conditions.[17,18] Data from the HAND-Q offer valuable insights into treatment outcomes from the patient's viewpoint, enhancing shared decision-making, patient expectation management, and the doctor-patient relationship.[19]

As PROMs are being increasingly used in clinical trials and routine care for hand-related conditions, the need for accessible normative data is essential to interpret and compare outcomes across different patient groups.[20] Normative data obtained from healthy individuals provide baseline outcomes from a population without the specific condition, serving as a critical reference point for contextualizing patient scores and understanding treatment effects. Currently, the HAND-Q lacks normative data, which limits its utility in comparative studies. We aimed to establish the first normative HAND-Q data from an international sample of healthy individuals, providing a benchmark for research and clinical application.

Materials and methods

An international study was conducted to obtain HAND-Q scores from the general population from 44 countries worldwide.

The HAND-Q

The HAND-Q, developed at Memorial Sloan Kettering Cancer Center (New York, USA) and Flinders University (Adelaide, Australia), is a PROM designed to assess health-related quality of life and patient satisfaction in individuals with congenital or acquired hand conditions. The instrument is modular and consists of four domains: appearance, health-related quality of life, experience of care, and treatment. These domains are subdivided into 14 independently functioning scales, including appearance, age-related appearance, function, life impact, psychological, sexual, symptoms, and satisfaction with clinic, doctor, hand therapist, information, office staff, outcome, and splint.[21]

For the purpose of this study, we selected the four most used scales—appearance (10 items), function (15 items), life impact (8 items), and symptoms (10 items)—because these capture physical and psychosocial aspects of hand health that are relevant to the general population. Each item is scored on a 4-point Likert scale, and raw scores are converted into Rasch scores ranging from 0 to 100. Higher Rasch scores reflect better hand-related quality of life and functionality.

Web-based questionnaire

An anonymous web-based questionnaire was developed and managed using REDCap (Research Electronic Data Capture) hosted by Catharina Hospital in Eindhoven, the Netherlands. REDCap is a secure, web-based software platform designed to support data capture for research studies.[22,23] The questionnaire was provided in English and Dutch and contained the HAND-Q, demographic variables, and supplementary questions addressing the absence or presence of hand complaints. Informed consent was provided by participants upon survey completion.

Recruitment of participants and data collection

Participants who were 18 years or older and fluent in English were recruited in August 2024 through Prolific, a crowdsourcing platform.[24] Additionally, the research team shared a QR-code or hyperlink in the Dutch population, encouraging further distribution. Data collection was carried out from August 1 to September 9 and was stored in the REDCap database. Participants who did not complete the questionnaire or those who reported any type of hand disorder or hand trauma were excluded from this study.

Statistical analysis

To establish HAND-Q normative data, descriptive statistics, including skewness, kurtosis, medians, and interquartile ranges (IQR), were assessed. Differences in HAND-Q scale scores across groups were assessed using the Mann-Whitney U or Kruskal-Wallis test with a Bonferroni correction. *P*-values of < 0.05 rejected the null hypothesis for all scales. Univariable linear regression models were used to determine potential significant associations between age, gender, relationship status, ethnicity, Fitzpatrick skin type, work, physically demanding work, hand function related work, hand appearance related work and smoking status, and the HAND-Q scale scores. Two-sided *p*-values < 0.05 were considered statistically significant.

Use of guidelines

This study is reported according to the STROBE guidelines.

Results

Between August 1 and September 9, 2024, a total of 2868 questionnaire entries were collected. Among these, 756 respondents were excluded owing to incomplete questionnaires, and an additional 728 respondents were removed owing to a medical history involving hand-specific issues. Six participants were underaged, and screening for duplicate entries led to the exclusion of 5 more respondents. After elimination, 1373 eligible participants remained. Among them, 55.8% were female, and the median age was 35 years (IQR 26–47 years). Most participants (63.8%) were of Caucasian descent. The respondents represented 44 different countries. Additional characteristics are detailed in Table 1.

The mean normative HAND-Q scale scores were 75.1 (SD 17.9; 95% CI [74.2, 76.1]) for appearance, 93.4 (SD 11.3; 95% CI [92.8, 94.0]) for function, 92.3 (SD 16.6; 95% CI [91.4, 93.2]) for life impact, and 83.8 (SD 14.9; 95% CI [83.0, 84.6]) for symptoms (Figure 1). The normative study population

Table 1 Participant characteristics.

Participant characteristics			N (%) 1373 (100)
Gender	Female		766 (55.8)
	Male		597 (43.5)
	Non-Binary		6 (0.4)
	Transgender		4 (0.3)
Mean age (SD), y			37.9 (SD 14.1)
Relationship status	Single		386 (28.1)
	In a relationship		437 (31.8)
	Married		495 (36.1)
	Divorced		39 (2.8)
	Widowed		16 (1.2)
Countries			44
Top 3 countries	England		339 (24.7)
	The Netherlands		284 (20.7)
	South-Africa		256 (18.6)
Ethnicity	White/Caucasian		876 (63.8)
	Black/African (American)		292 (21.3)
	Asian		92 (6.7)
	Hispanic/Latino		36 (2.6)
	Other and unknown		77 (5.6)
Skin type	1		121 (8.8)
	2		611 (44.5)
	3		312 (22.7)
	4		179 (13.0)
	5		124 (9.0)
	6		26 (1.9)
Smoking	Never		897 (65.3)
	Yes/former		476 (34.7)
Mean years since smoking cessation (SD)			10.8 (SD 9.8)
Occupational status	Work		1013 (73.8)
		Hand-related physical work	180 (17.8)
		No hand-related physical work	779 (76.9)
		Unknown	54 (5.3)
		Hand appearance related work	239 (23.6)
		No hand appearance related work	775 (76.5)
	No work		360 (26.2)
		Student	186 (13.5)
		Unemployed	107 (7.8)
		Retired	67 (4.9)

SD, standard deviation.

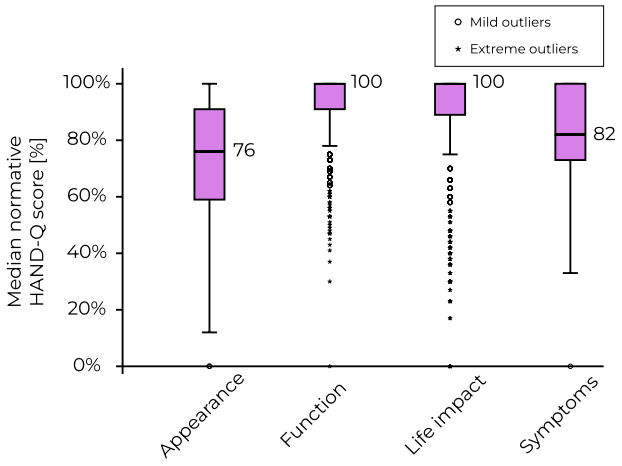

Figure 1 Boxplot of median normative HAND-Q scores. The median values related to their scales are included in the boxplot.

was further stratified by various demographic characteristics, and comparisons were made across the four HAND-Q scales. Participants 40 years and older had significantly higher scale scores for life impact ($p < 0.001$) and symptoms (p=0.042), whereas no significant differences were noted for the appearance and function scales. Univariable linear regression analysis for age demonstrated a statistically significant positive association with life impact (p=0.002) and symptoms (p=0.001) scales. This shows an improvement of 0.10 scale points in the life impact domain, and 0.09 scale points in the symptoms scale with every additional year. No statistically significant associations were observed between age and the appearance or function scales.

Moreover, no statistically significant differences were found between male and female participants across any of the HAND-Q scales, including univariable regression analysis. However, despite the small size of this subgroup, gender-stratified analyzes showed that respondents identifying as transgender and non-binary (n = 10; 0.7%) reported lower scores on the appearance scale (mean 58.9, SD 12.3) compared with male (mean 76.1, SD 17.4) and female respondents (mean 74.6, SD 18.1). Similarly, transgender and non-binary respondents reported lower scores on the function scale (mean 77.4, SD 29.3) versus males (mean 93.8, SD 10.9) and females (mean 93.3, SD 11.1), as well as on the life impact scale (mean 80.6, SD 18.4) compared with males (mean 91.8, SD 17.0) and females (mean 92.8, SD 16.2). Relationship status was associated with appearance scores, with single and widowed individuals scoring lower than those in a relationship, divorced, or married (p=0.017). For univariable linear regression, relationship status was significantly associated with appearance-related quality of life (p=0.007), with individuals in relationships reporting better outcomes. No associations were found for the function, symptoms, or life impact scales in relation to relationship status.

Similarly, skin type was a relevant factor for appearance; participants with Fitzpatrick skin types 4, 5, or 6 scored significantly higher on the appearance scale ($p < 0.001$) compared to those with skin types 1, 2, or 3. Interestingly, those with skin types 4 and 5 scored significantly lower on the symptoms scale (p=0.002) compared to other skin types, whereas no significant differences were noted for the function (p=0.142) and life impact scales (p=0.137). Regarding univariable regression analysis, darker skin types were significantly associated with improved appearance ($p < 0.001$), life impact (p=0.016), and symptoms (p=0.002) scores.

Employment status significantly influenced outcomes, with employed participants reporting higher appearance scale scores (p=0.043). In contrast, no statistically significant association was observed between physically demanding work and appearance scores (p=0.126). However, individuals in occupations where hand function is critical, such as carpenters and hairdressers, scored significantly higher on the appearance (p=0.043) and life impact (p=0.011) scales. In addition, those in occupations where hand appearance is important, such as in the hospitality industry, also scored significantly higher on the appearance scale (p=0.030). Occupational factors revealed additional associations. Individuals employed in roles where hand function is essential showed significantly higher appearance (p=0.049) and life impact scores ($p = 0.026$). Moreover, occupations emphasizing hand appearance were linked to higher scores on the appearance scale (p=0.032), but lower scores on the function (p=0.045) and symptoms scales (p=0.042).

Similar to employment status, smoking status was significantly associated with several HAND-Q scales, with smokers scoring significantly lower on the appearance (p=0.005), function (p=0.010), and symptoms (p=0.002) scales, with no significant differences observed on the life impact scale (p=0.53; Table 2). Univariable linear regression analysis showed that smoking behavior was negatively associated with quality of life-related outcomes. Individuals who smoked or had a history of smoking showed significantly lower scores on the appearance (p=0.009), function (p=0.007), and symptoms ($p < 0.001$) scales. Among those with a history of smoking, smoking cessation was positively associated with a higher function and life impact scores. Specifically, each year since quitting smoking was associated with a 0.19-point increase in the function scores (p=0.008) and a 0.25-point increase in the life impact scores (p=0.018). No significant associations were observed between smoking cessation and the appearance or symptoms scales. A detailed overview of all variables, including unstandardized regression coefficients and p-values, is provided in Table 3.

Discussion

This study presents the first reference values for HAND-Q scales that are applicable to the general population (i.e., appearance, function, life impact, and symptoms), based on a large international sample of healthy individuals without hand conditions. These scales were chosen because together they encompass physical and psychosocial aspects of hand health, making them particularly relevant for use in the general population. The collected data offer an essential reference point for interpreting HAND-Q scores in clinical practice and research. This study demonstrated that

Table 2 Demographic and clinical characteristics by baseline scores.

Variables	N (%)	Baseline appearance score, mean (SD)	Appearance p-value	Baseline function score, mean (SD)	Function p-value	Baseline life impact score, mean (SD)	Life impact p-value	Baseline symptoms score, mean (SD)	Symptoms p-value
Age, y			0.813		0.189		< 0.001		0.042
18-39	778 (56.7)	75.2 (SD 17.4)		92.9 (SD 12.0)		91.1 (SD 17.7)		83.0 (SD 15.3)	
≥40	595 (43.3)	75.0 (SD 18.4)		94.1 (SD 10.3)		93.8 (SD 14.9)		84.9 (SD 14.2)	
Gender*			0.142		0.165		0.125		0.495
Male	597 (43,5)	76.1 (SD 17.4)		93.8 (SD 10.9)		91.8 (SD 17.0)		84.2 (SD 14.4)	
Female	766 (55.8)	74.6 (SD 18.1)		93.3 (SD 11.1)		92.8 (SD 16.2)		83.5 (SD 15.2)	
Relationship status			0.017		0.637		0.219		0.400
Single	386 (28.1)	72.8 (SD 17.7)		92.7 (SD 11.7)		92.1 (SD 16.6)		83.1 (SD 15.0)	
In a relationship	437 (31.8)	75.6 (SD 17.8)		93.1 (SD 11.9)		91.4 (SD 17.1)		83.5 (SD 15.1)	
Married	495 (36.1)	76.5 (SD 18.0)		94.0 (SD 10.4)		93.0 (SD 16.4)		84.4 (SD 14.5)	
Divorced	39 (2.8)	78.3 (SD 17.6)		95.1 (SD 8.7)		93.8 (SD 14.3)		86.4 (SD 14.7)	
Widowed	16 (1.2)	71.1 (SD 13.2)		92.8 (SD 14.7)		94.2 (SD 16.3)		86.6 (SD 17.3)	
Ethnicity			< 0.001		0.082		< 0.001		< 0.001
White/Caucasian	876 (63.8)	73.5 (SD 18.1)		93.9 (SD 10.5)		93.6 (SD 14.6)		84.9 (SD 13.9)	
Other	426 (31.0)	77.9 (SD 17.0)		92.1 (SD 12.6)		89.4 (SD 19.6)		81.2 (SD 16.4)	
Unknown	71 (5.2)								
Skin type			< 0.001		0.142		0.137		0.002
1	121 (8.8)	73.9 (SD 20.3)		91.9 (SD 13.9)		92.7 (SD 16.2)		83.7 (SD 14.9)	
2	611 (44.5)	74.1 (SD 17.6)		94.2 (SD 10.1)		93.1 (SD 15.5)		85.3 (SD 14.0)	
3	312 (22.7)	73.0 (SD 18.1)		93.2 (SD 11.2)		93.1 (SD 14.7)		84.0 (SD 14.5)	
4	179 (13.0)	78.2 (SD 17.0)		92.7 (SD 11.8)		89.4 (SD 19.1)		80.2 (SD 15.6)	
5	124 (9.0)	79.7 (SD 15.1)		92.1 (SD 13.1)		89.4 (SD 21.9)		81.0 (SD 17.8)	
6	26 (1.9)	87.3 (SD 16.1)		95.6 (SD 12.3)		93.6 (SD 16.0)		86.6 (SD 15.6)	
Occupational status			0.043		0.130		0.412		0.458
Occupation	1013 (73.8)	75.7 (SD 18.0)		93.7 (SD 10.9)		92.3 (SD 16.8)		84.0 (SD 14.9)	
No occupation	360 (26.2)	73.6 (SD 17.2)		92.4 (SD 12.2)		92.1 (SD 16.1)		83.3 (SD 15.0)	
Physically demanding occupation			0.126		0.293		0.298		0.854
Yes	180 (18.8)	77.4 (SD 18.2)		94.3 (SD 10.3)		94.0 (SD 14.3)		84.0 (SD 15.0)	
No	779 (81.2)	75.1 (SD 18.1)		93.6 (SD 11.0)		92.0 (SD 17.2)		84.3 (SD 14.8)	
Hand function related occupation			0.043		0.429		0.011		0.881
Yes	793 (78.3)	76.3 (SD 17.9)		93.9 (SD 10.9)		92.9 (SD 16.3)		84.0 (SD 14.8)	
No	220 (21.7)	73.6 (SD 18.2)		93.2 (SD 11.0)		90.1 (SD 18.4)		84.1 (SD 15.2)	
Appearance related occupation			0.030		0.236		0.070		0.097
Yes	240 (23.5)	77.9 (SD 17.7)		92.5 (SD 13.0)		91.5 (SD 16.5)		82.3 (SD 16.4)	
No	781 (76.5)	75.0 (SD 18.1)		94.1 (SD 10.1)		92.6 (SD 16.8)		84.6 (SD 14.3)	
Smoking status			0.005		0.010		0.53		0.002
Yes/Former	476 (34.7)	73.4 (SD 18.1)		92.3 (SD 12.3)		91.2 (SD 17.3)		82.0 (SD 15.9)	
No	897 (65.3)	76.1 (SD 17.7)		94.0 (SD 10.6)		92.9 (SD 16.2)		84.8 (SD 14.3)	

Demographic and clinical characteristics by baseline appearance, function, life impact, and symptoms scores. Significant when p≤0.05. SD, standard deviation; y, year.

* Gender other than male and female were excluded from this analysis owing to the small number of participants.

Table 3 Univariable linear regression coefficients.

Variables	Appearance		Function		Life impact		Symptoms	
	Unstandardized B	p-value	Unstandardized B	p-value	Unstandardized B	p-value	Unstandardized B	p-value
Age, y	0.026	0.450	0.035	0.104	0.101	**0.002**	0.091	**0.001**
Gender*	1.492	0.125	0.451	0.452	-1.077	0.234	0.681	0.402
Relationship yes/no	2.853	**0.006**	0.655	0.315	-0.115	0.905	0.464	0.590
Ethnicity	4.367	**< 0.001**	-1.802	**0.007**	-4.163	**< 0.001**	-3.706	**< 0.001**
Skin type**	1.853	**< 0.001**	-0.204	0.430	-0.918	**0.016**	-1.048	**0.002**
Work	-2.112	0.054	-1.279	0.064	-0.226	0.825	-0.777	0.396
Physically demanding work	-2.315	0.123	-0.701	0.435	-2.003	0.147	0.303	0.805
Hand function related work	-2.711	**0.049**	-0.698	0.401	-2.843	**0.026**	0.123	0.914
Appearance related work	-2.859	**0.032**	1.610	**0.045**	1.110	0.369	2.231	**0.042**
Smoking status	2.633	**0.009**	1.710	**0.007**	1.698	0.071	2.839	**< 0.001**
Smoking cessation, y	-0.125	0.228	0.189	**0.008**	0.250	**0.018**	0.174	0.059

Univariable linear regression coefficients for HAND-Q appearance, function, life impact, and symptoms scores. Significant when p≤0.05. y, year. Reference variables: gender; female, ethnicity; Caucasian, for all other determinants the reference is "yes."

* Gender other than male and female were excluded from this analysis due to the low number of participants.

** Skin type is measured on an ordinal scale

factors such as age, relationship status, smoking behavior, skin type, and occupation significantly correlated with different outcomes in the HAND-Q domains.

Interestingly, despite ageing of the skin and receding hand function, age was positively associated with scores on the life impact and symptoms scales. Individuals aged 40 years and older report fewer symptoms and higher satisfaction with life. This may reflect greater psychological resilience among older individuals, who may exhibit enhanced coping strategies and less psychosocial stress, even when physical impairments are present.[25-27] In the current study, the underrepresentation of individuals aged 60 and above (9.2%) limits the generalizability of our findings to older adults. In contrast, younger adults may be more affected by social comparison and body image concerns, potentially exacerbated by social media exposure, which may negatively influence their self-perceived quality of life.[28-30] Future studies should aim to include a more diverse age range.

Type of employment, particularly occupations involving hand function or appearance, was another significant factor. Employed participants, especially among workers who are involved in manual performance or hand esthetics, reported higher appearance scores. Additionally, those with a job requiring hand functionality presented better life impact scores. These findings suggest that individuals in such professions may develop a stronger awareness of, or interest in their hand-related capabilities and presentation, potentially influencing their subjective evaluations. Employment in general may confer additional psychological benefits, including a sense of purpose, routine, and social connectedness, which positively influence health-related quality of life.[31]

Current and former smokers reported lower scores on the appearance, function, and symptoms scales. This is consistent with established knowledge about the detrimental effects of smoking on vascular health, skin integrity, and musculoskeletal function, all of which can impact the hand's appearance and functional capacity.[32-34] Smoking was negatively associated with scores on the life impact scale. Interestingly, individuals who had quit smoking demonstrated a modest but statistically significant improvement in function and life impact scores over time, supporting existing evidence on the benefits of smoking cessation for physical recovery and overall well-being.[35] Furthermore, individuals with higher Fitzpatrick skin types demonstrated more favorable outcomes on several HAND-Q scales. These differences may reflect diverse cultural norms and esthetic preferences across ethnic groups, although the underlying mechanism remain unclear and warrant further investigation.[36-38]

Although no statistically significant differences were observed between male and female participants on any of the HAND-Q scales, participants identifying as being outside the male-female binary spectrum (e.g., non-binary and gender-diverse individuals) tended to score lower. Given the small size of this subgroup (n=10), these findings are included with exploratory intention for further gender inclusive studies and should be interpreted with caution. Larger, more gender-diverse cohorts are needed to determine whether this pattern reflects a true difference.

Despite a large sample size, some limitations must be acknowledged. The survey was distributed only in English and Dutch, possibly introducing linguistic and cultural bias.

Online recruitment via Prolific, although efficient, it may not fully represent the general population, resulting particularly in a deficiency of individuals aged over 60 years, and participation incentives could affect response quality. Given these limitations, the normative data provide an initial reference framework rather than a globally representative standard, whereas subgroup analyzes remain exploratory and may guide future research. In future studies, more diverse cultural backgrounds and balanced representation of all age groups should be considered. Only 4 of the 14 HAND-Q scales were included in this study. Although having normative data for all scales could be beneficial, it is not feasible for those scales that specifically address treatment experiences or satisfaction with care, as these require participants to have undergone treatment for a hand condition. Therefore, normative scores for these scales cannot be meaningfully established in a healthy population.

Conclusion

In conclusion, HAND-Q values obtained from this large normative data study offer critical context for interpreting patient scores, aiding clinicians in benchmarking outcomes and facilitating patient-centered care. Several demographic and lifestyle factors, including age, relationship status, smoking behavior, skin type, and occupation, showed statistically significant associations with HAND-Q domains. This underscores the importance of considering patient background factors when assessing health-related quality of life in relation to the hand. The findings support the clinical utility of the HAND-Q and provide a foundation for future research and application in surgical and conservative management of hand and wrist conditions.

Ethical approval

Obtained. Medical ethical approval number W24.093.

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Reprint request

None declared.

Data availability

The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

Declaration of Competing Interest

Nothing to disclose.

Appendix A. Supporting information

Supplementary data associated with this article can be found in the online version at doi:10.1016/j.bjps.2026.05.071.

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Supplementary table: Participants' country of residence

Country of residence of all participants, n=number

Country of residence	N
England	339
The Netherlands	284
South-Africa	256
Poland	51
Italy	45
Portugal	44
Spain	36
United States of America	33
Germany	31
Canada	27
France	24
Scotland	23
Australia	18
Greece	18
Hungary	14
Belgium	12
Sweden	12
Wales	12
Ireland	11
India	9
Mexico	9
Finland	7
Kenya	6
Northern Ireland	6
Austria	4
Czech Republic	3
Denmark	3
Israel	3
Norway	3
Slovakia	3
Switzerland	3
Chile	2
Estonia	2
Latvia	2
Slovenia	2
Brazil	1
Colombia	1
Croatia	1
Indonesia	1
Morocco	1
New-Zealand	1
Pakistan	1
Romania	1
UAE	1
Unknown	7