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Article

# Profiling Operating Room Staff by Their Socks: A Multicentre Survey Exploring Diversity Within Uniformity

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## Highlight

### What is already known on this topic?

- The operating room is a meticulously controlled environment where personal identity is largely suppressed.
- Socks are widely recognised as a subtle yet potent form of self-expression.
- One anecdotal sock-study among a dozen surgeons yielded inconclusive findings.

### What this study adds?

- Provides the first multicentre investigation into sock choices and sock-related behaviours across a broad range of OR staff.
- Reveals that socks mirror generational, gender-based, and professional differences in identity and behaviour.
- Underscores the cultural and behavioural value of socks as a sanctioned outlet for individuality in an otherwise uniform domain.

## Abstract

**Objective:** To explore how operating room (OR) sock choices reflect professional identity and behaviour, and how these vary by gender, generation, and clinical role. **Design:** Multicentre cross-sectional survey. **Setting:** Operating rooms in 42 Dutch hospitals. **Participants:** 935 operating room staff members, including doctors, nurses, students and support staff. **Main outcome measures and variables:** Self-reported sock characteristics included sock age, height, colour, and the SCALPEL-sock score, which categorised the visual style of the OR socks worn. Sock usage patterns—such as the number of socks owned and monthly frequency of wearing clean socks—were assessed. Sock-related behaviours comprised opinions on odd socks, general attitudes towards socks (functional vs expressive), and frequency of sock sniffing. All variables were analysed in relation to demographic and professional factors. **Results:** Leading in both SCALPEL-scores and the belief that socks serve as self-expression, women (73.4%) and nurses (70.7%) emerged as the most style-conscious sock wearers in the OR. Bare feet in clogs were rare (3%) but spiked among orthopaedic surgeons (13%). Sock sniffing was remarkably common, with 28% of participants admitting to the habit. Men—especially male doctors, sniffed more than twice as often as women, who simply changed socks more frequently. The ten most enthusiastic sniffers, true olfactory outliers, averaged 74.5 sniffs per month (overall group mean: 2.5), peaking at 180. Boomers held on to older socks; nurses and women preferred newer socks. Younger generations held the boldest sock philosophies in theory—but their actual socks told a more modest story. Most participants (70%) saved odd socks in hope of reunion, rather than discarding or mixing them. Based on mean values and modal responses, a typical ORDinary profile emerged—our archetypical staff member: a 42-year-old millennial female working in a teaching hospital wearing ankle-high blue socks, EU size 40.6, less than a year old, freshly changed, never sniffed. The sock drawer holds 34.5 pairs—and a quiet faith that single sad socks will one day find their match. **Conclusions:** In the highly standardised environment of the operating

room, socks emerge as a subtle marker for personal expression. Our findings show that even in a setting defined by conformity, this sign of individuality slips quietly beneath the radar—warming not just feet, but identity.

**Keywords:** operating staff; sniffing; sock; uniformity

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## Introduction

In the high-stakes world of the operating room (OR), precision reigns, and uniformity is the law. Staff wear identical scrubs, sterile gowns, facemasks, protective glasses, and hair covers.

While essential for sterility and patient safety, this uniformity transforms colleagues into an army of anonymous professionals.

Much like Tarantino's colour-coded criminals, OR staff don't choose their colours—they are assigned them [1]. Mr Blue or Mrs Green vanish into their mandated OR gowns.

Socks, however, are where personality sneaks in.

In Dutch ORs, socks and clogs are the only permitted forms of personal expression. In the US (and on every medical drama), personalised scrub caps flourish—from cartoons to superheroes to embroidered nicknames. Across most of Europe, hospitals stick to standard-issue caps [2].

To date, the literature contains only one anecdotal account of sock choices: age and colour among a dozen surgeons [3].

This study explores whether socks can serve as markers of identity recognition and behavioural expression in the strictly standardised environment of the OR.

Inspired by criminal profiling frameworks, we applied a sock profiling approach to investigate whether sock choices reflect demographic traits, visual characteristics, and behavioural tendencies [4].

## Methods

This study is reported in accordance with the STROBE (Strengthening the Reporting of Observational Studies in Epidemiology) guidelines [5].

### *Study Design*

A multicentre cross-sectional survey

### *Setting*

Data were collected from hospitals across the Netherlands during May 2025.

### *Recruitment and Participants*

In each hospital, a designated "sock scout" — the local lead for study inclusion — affixed a study recruitment poster with a QR code in the OR complex and encouraged staff to participate.

Eligible participants included all OR personnel aged 18 years or older who agreed to provide demographic data and complete a short online survey.

### *Profiling*

We adapted the six-step criminal behavioural profiling model by Douglas et al. to construct profiles of sock-related expression among operating room staff [4].

#### ► *Input*

Participants accessed the survey by scanning a QR code linking to a questionnaire on Google Forms. They then completed a brief survey.

All data were anonymised and securely stored in a spreadsheet (Excel 2016, Microsoft Corp), ensuring participant confidentiality.

Survey variables were grouped into three domains:

● *Demographics*

We collected data on age, gender, professional role (doctors, nurses, medical students and support services), hospital type (academic/teaching, general, private), shoe size, and generational cohorts: Boomers (born 1946–1964), Generation X (1965–1980), Millennials (1981–1996), or Generation Z (1997–2012) [6].

● *Sock characteristics*

Respondents reported on the style and design of the socks they were wearing at the OR during the survey (sock age, height, colour, and sock style), as well as general usage patterns such as the number of socks owned (“drawer volume”) and the monthly frequency of wearing clean socks.

● *Sock-related behaviours*

We also assessed behavioural aspects, including how participants respond to odd socks, general attitudes towards socks and how often they engaged in sock sniffing.

► *Decision process model*

Socks were classified using the SCALPEL-sock score (0 to 6 points) by the participants on the OR.

- |   |   |
|---|---|
| • Simple Colour: boring, one colour                             | 0 |
| • ALright: vibrant colour(s) or minimal patterns                | 2 |
| • Pristine: striped or checkered or dotted or creative patterns | 4 |
| • ELite: exclusive/legendary or top-tier thematic designs       | 6 |

Higher scores denote socks showing greater visual flair and thematic creativity.

This novel scoring system shows strong face validity as a measure of sock-based self-expression. Its categories reflect commonly observed stylistic variations and align with the aim of exploring individuality in uniform OR environments [7]. Dominant sock colour was categorised using the “Eleven Basic Colour Terms” [8].

A multiple-choice question assessed attitudes towards socks: How would you describe the way your socks express you in the OR?

- Functional—socks are just socks
- Comfort—neutral professionalism
- Expression—playful identity
- Signature—a unique statement

For analysis, the first two responses were grouped as *Functional* and the latter two as *Expressive*.

Participants could choose one of three responses when confronted with an odd sock: save for reunion, discard, or mix and match.

Sock height was categorised into 4 levels: bare feet, no show, around ankle to mid-calf, and above

► *Assessment/Statistical analysis*

All *statistical analyses* were performed using Stata v14.0. Descriptive statistics (means, SDs, medians, ranges, proportions) were calculated.

Group differences were assessed using Welch’s t-test or Mann–Whitney U test, depending on distribution.

Multiple-group comparisons used the Kruskal–Wallis test. When significant, post hoc pairwise comparisons were conducted manually using Mann–Whitney U tests, the Bonferroni correction was applied to adjust for multiple testing.

Categorical associations were tested using chi-squared tests. Spearman’s correlation assessed numerical associations. Logistic regression was used for binary outcomes, reporting odds ratios with 95% confidence intervals. A two-tailed p-value < 0.05 was considered significant unless stated otherwise.

### ►Sock profile

We constructed archetypal profiles by combining demographic, sock, and behavioural data. These were not exact representations but stylised composites designed to illustrate recurring patterns.

### ►Investigation

Analyses focussed on variation by professional role, gender, and generation. We compared subgroups to explore differences in sock-related expression and behavioural variation.

### ►Apprehension

Profiles were identified through comparative analysis, highlighting both typical and atypical combinations—outliers included. While no arrests were made in the literal sense, sock profiling revealed distinct stylistic phenotypes within the sterile professional setting of the OR.

### *Ethical Considerations*

The local ethics board in Zwolle confirmed no ethical approval was required. Participants provided digital consent, all data were anonymised

## Results

### *Study Participants*

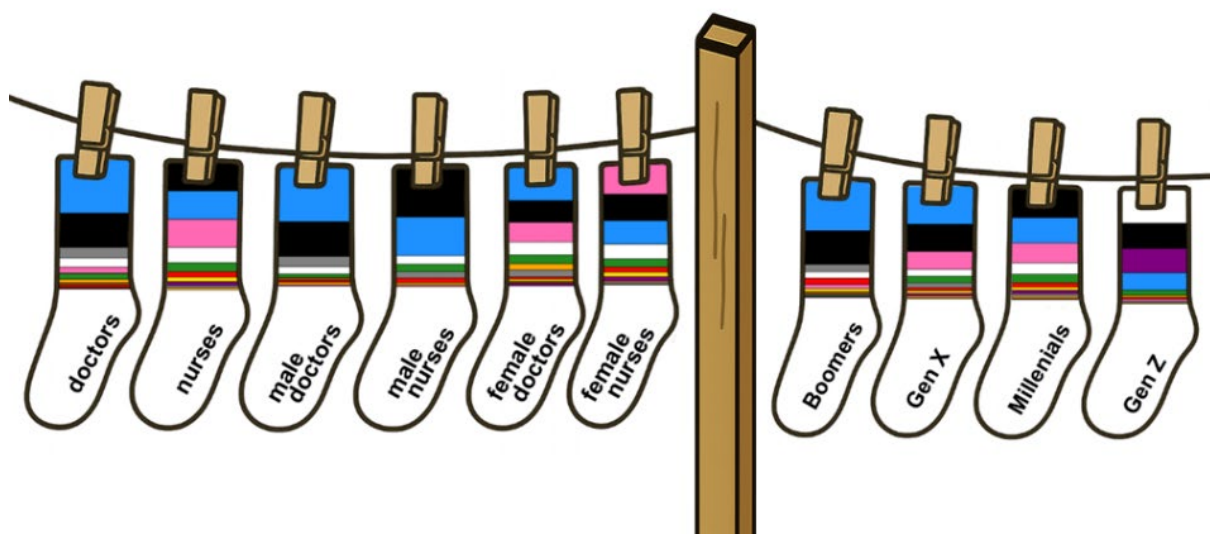
Of the 96 invited hospitals, 42 participated (response rate 43.8%, teaching/academic n=20, general n=19, private n=3), contributing 935 participants (Table 1). The sample consisted of 31.9% males, 67.4% females, 25.2% doctors, 68.3% nurses, 2.8% medical student and 3.7% support staff. The top ten centres accounted for 60.5% of participants. The mean age was 42.2 years (SD±10.8), with male respondents being older than females (45.4 vs. 40.7 years,  $p < 0.05$ ); the average shoe size was EU 40.6 (SD±2.7), UK 7. Participants belonged to four generational cohorts: Boomers (n=80), Gen X (n=304), Millennials (n=404) and Gen Z (n=141).

### *Sock Characteristics*

OR staff owned an average of 34.5 pairs of socks and wore 33.4 clean pairs per month. Socks younger than one year were most common among women and nurses (both 42.5%), compared to 30.3% of men and 28.8% of doctors. Boomers had the smallest proportion of wearing socks less than a year old (26.6%).

Bare feet in clogs were rare overall (3.0%) but more common among orthopaedic surgeons (13.0%) and male doctors (10.5%), and nearly absent among nurses (0.5%) — with zero reports among male nurses. Most participants wore ankle-to-mid-calf socks (77.7%).

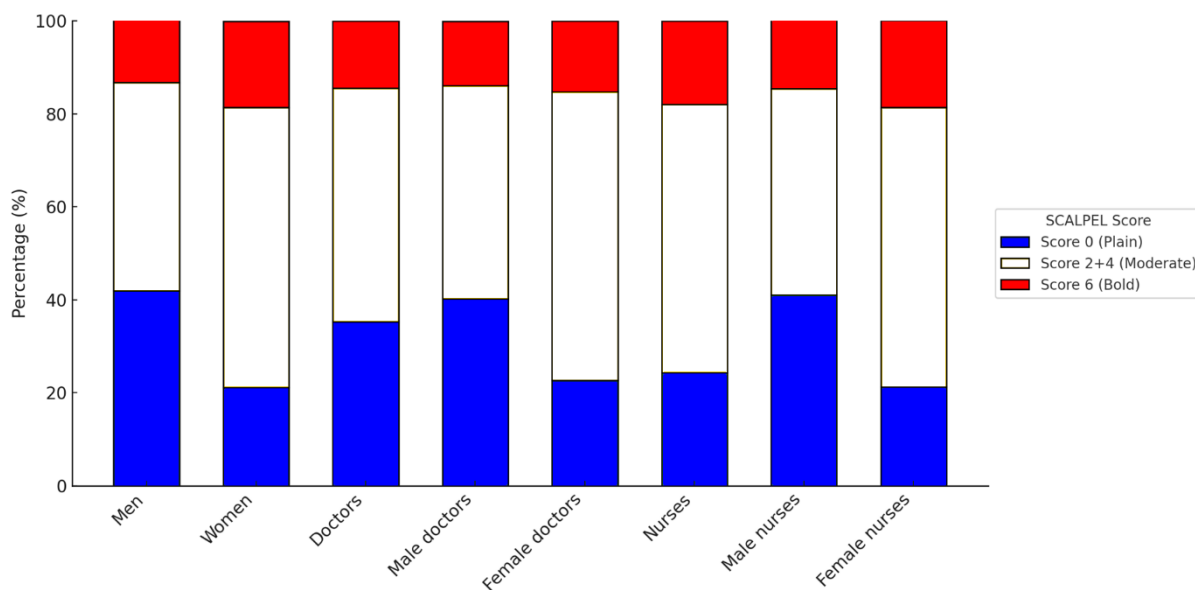
Blue (26.1%) and black (25.2%) socks dominated. Pink socks were popular among female staff (16.2%) and white among Gen Z (30.5%); Figure 1. Orthopaedic surgeons distinctly preferred blue socks (46.0%).



**Figure 1.** Sock-stacking visualisation

Dominant sock colours worn in the operating room. The "No socks" category was excluded.

In terms of style the median SCALPEL-Sock Score was 4. Plain socks were more common among men (score 0, 41.9% vs. women 21.1%), while women wore a greater portion of bold and elite-rated socks (score 6, women 18.5% vs. men 13.9%) (Figure 2). Nurses had significantly higher scores than doctors ( $p = 0.01$ ).



**Figure 2.** Distribution of SCALPEL sock style scores.

Score 0: plain, Score 2 and 4: moderate, Score 6: bold. Median SCALPEL-scores were: men 2, women 4, doctors 2, male doctors 2, female doctors 4, nurses 4, male nurses 2 and female nurses 4.

*Sock-Related Behaviours*

OR Sock Expression

Attitudes towards socks varied considerably across participants. Overall, 63.9% (95% CI: 60.8%–67.0%) reported an expressive sock attitude (expression or signature), while 36.1% (95% CI: 33.0%–39.2%) leaned towards a practical approach (function or comfort).

Women were significantly more expressive through socks than men (73.4% vs 43.1%, OR = 3.66; 95% CI: 2.73–4.89;  $p < 0.001$ ); nurses more than doctors (70.7% vs 47.8%, OR = 2.63, 95% CI: 1.93–3.58,  $p < 0.001$ ).

Female nurses topped the expressiveness scale (75.2%), while male doctors were the most practically inclined (57.3%).

Expressiveness was highest among Millennials (67.4%) and Gen Z (66.7%), followed by Gen X (61.8%) and Boomers (48.1%).

Compared to Boomers, younger generations had twice the odds of expressing themselves through their socks (OR=2.03; 95% CI: 1.27-3.25;  $p = 0.003$ )

### Dealing with an Odd Sock

When confronted with a sad single sock [9], 69.8% saved it in hopes of a reunion, 16.7% discarded it, and 13.5% embraced a creative “mix-and-match” strategy. These patterns were consistent across genders and professions.

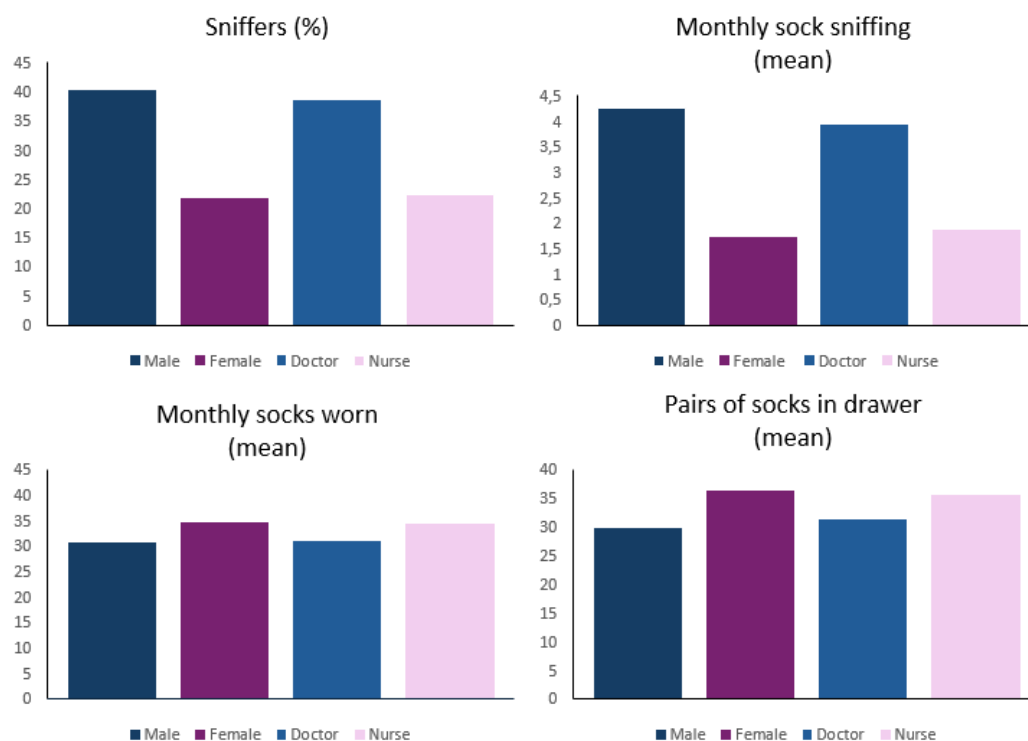
### Sniffing Behaviour

Men had 2.4 times higher odds than women of sniffing their socks at least once a month.

(OR = 2.43, 95% CI: 1.80–2.27,  $p < 0.001$ ). Nurses had significantly lower odds of engaging this behaviour compared to doctors (OR=0.46, 95% CI:0.33-0.63,  $p < 0.001$ ); Figure 3. Nearly half (42.5%) of male doctors reported sniffing their socks at least once a month compared to 25.5% of female doctors.

Gen Z had the highest percentage of sniffers (37.6%) and Boomers the least (23.8%)

The ten most enthusiastic sock sniffers reported an average of 74.5 monthly sock sniffs (range 40–180; overall group average 2.5). Mean age: 47.7 years; median Scalpel-sock score 2. The group was evenly divided by gender and profession.



**Figure 3:** Sock-related behaviour among operating room staff















Analysed by gender (male vs. female) and profession (doctor vs. nurse). Differences between genders and professions are statistically significant across all four categories ( $p < 0.05$ ).

*Orthopaedic Surgeons vs. Anaesthesiologists*

Anaesthesiologists had more than four times the odds of adopting an expressive sock attitude than the practical orthopaedic surgeons (71.4% vs 38.1%, OR = 4.05, 95% CI: 1.75–9.39,  $p = 0.004$ ). This effect was not reflected in a significant difference in SCALPEL-scores.

#### Meet the ORdinary

Blending “Operating Room” and “ordinary” — with a nod to the now-retired term “orderly” — this term profiles the archetypical staff member, based on mean values and modal responses: a 42-year-old millennial female working in a teaching hospital — wearing ankle-high, blue socks, less than a year old, size EU 40.6, freshly changed, never sniffed, owning a drawer stocked with 34.5 pairs, and faithful that odd socks will once again find their match (Figure4). She might be standing right behind you.

	Female		Teaching		Not barefoot
	42.2 yrs		No sniffer		Scalpel-score 3.5
	Millennial		Blue	< 1 yr old icon" data-bbox="695 445 755 492"/>	< 1 yr old
	Nurse		Ankle high		33.4 pairs/month
	EU 40.6 UK 7		Saved odd sock		Owns 34.5 pairs

**Figure 4.** The Ordinary

A visual profile of our typical average operating room staff member, as imagined through socks, roles, and rituals. Constructed using mean values and modal responses across demographic, behavioural, and sock-related variables.

How ORdinary are you? (score yourself: Appendix A)

**Table 1.** Participant's demographics.

Function	Total (n=935) (male: n = 312/ female: n = 618/ diverse: n = 5)	Mean age				Surgical department		Anaesthesiolog y department	
		Tota l	Mal e	Femal e	Divers e	Orthopaedic s	Divers e	Not state d	
<b>Consultant surgeon</b>	135 (116/19/0 )	50.3 ± 8.2	51.0 ± 8.0	46.2 ± 8.3		100	29	6	
<b>Consultant anaesthesiologi st</b>	35 (20/15/0)	46.1 ± 8.7	47.9 ±	43.9 ± 6.0					35
<b>Fellow</b>	12 (9/3/0)	36.7 ± 2.5	36.7 ± 2.6	36.7 ± 2.9		6	1	0	5
<b>Resident doctor / Specialty trainee</b>	41 (28/13/0)	32.8 ± 2.4	32.8 ± 2.2	32.8 ± 3.0		25	9	4	3
<b>Resident doctor / Non-trainee</b>	13 (8/5/0)	29.3 ± 2.7	29.8 ± 2.6	28.6 ± 2.9		9	4	0	0
<b>Medical student</b>	26 (7/18/1)	25.7 ± 2.6	26.4 ± 1.9	25.7 ± 2.6	20.0	5	16	0	5
<b>Nurse</b>	639 (98/536/5 )	41.7 ±	46.1 ±	41.0 ± 11.5	38.7 ± 14.5				
<b>House keeper</b>	16 (9/6/1)	39.1 ±	37.1 ±	40.8 ± 13.1	45.0				
<b>Administration</b>	15 (3/12/0)	51.6 ± 7.4	49.0 ± 9.5	52.3 ± 7.2					

Participants' characteristics by professional role, age, and gender; "diverse" refers to non-binary and undisclosed identities. Total N=935; professional role known for 932 participants. The nurse category includes operating theatre nurses (n = 419), anaesthetic nurses (n = 158), and recovery nurses (n = 62).

## Discussion

### Summary of Main Findings

Our study shows that socks in the operating room are more than mere footwear: they reflect age, gender, style, behaviour, professional role, and even olfactory habits. They remain a rare outlet for individual expression in an increasingly standardised environment.

### *Key Findings*

Sock style ranged from dull conformity to exuberant flair. Both self-reports (theory) and SCALPEL scores (reality) revealed greater and consistent stylistic boldness among women and nurses. Generational differences emerged in philosophy, not in practice – suggesting that younger staff may aspire to individuality, but did not express this visibly.

Blue and black socks dominated, making up over half of all pairs. Female nurses were far bolder than female doctors, embracing pink, purple, and yellow. Male staff—doctors and nurses alike—seemed to prefer uniformity, with plain blue and black socks marking their expressive ceiling. Over 40% of male nurses wore only plain socks, nearly twice the rate of their female colleagues.

Going barefoot—particularly among male doctors—raises both eyebrows and questions. Whether this was rebellion, ventilation or poor laundry planning is anyone's guess. Nurses remained almost universally socked, with male nurses upholding full compliance. For orthopaedic surgeons—often ankle-deep in irrigation fluids—going barefoot in clogs may simply be a survival strategy.

Doctors wore older socks than nurses—whether this reflects practical laziness or a blind spot in the morning routine remains uncertain. Boomers were least likely to wear newer socks. Perhaps they were unwilling to abandon socks whose elastic has surrendered, but not yet retired.

The odd sock – long a subject of scientific enquiry, and cultural reflection – was explicitly addressed [9,10]. We expected Boomers to discard and Gen Z to embrace more artistic mixing strategies. But sentiment triumphed: most participants defied the odds by saving the single sad sock in the hope of reunion.

Then there comes the important question of sock sniffing. Socks rank among the most frequently sniffed garments [11], their smell originates from bacterial sweat metabolism, producing volatile compounds also found in cheese [12,13].

Men—especially male doctors—showed clear preference for post hoc olfactory inspection, sniffing more than twice as often as women. Women, meanwhile, simply wore more clean socks per month: swap, don't sniff.

Presumably undertaken off-duty and behind closed doors, the unexpectedly high frequency of self-sniffing—up to 180 times per month—may seem eccentric, or simply Proustian: the evocative power of scent to unlock vivid personal memories [14].

Sock-sniffing may seem ceremonial, misplaced, or tragically ineffective as a hygienic check.

Yet it may serve a pragmatic role. In multi-cycle use, it becomes an olfactory triage tool – provided the fine line between prudent reuse and overambitious stretching is not crossed.

Perhaps the practice deserves not disdain but a quiet nod of respect – a balance between practicality and social survival. Ultimately, the sniff may say more about the sniffer than the sock.

### *Strengths and Limitations*

To our knowledge this is the first multicentre study to explore sock behaviour in the operating theatre—a topic long overlooked, despite being quite literally under our noses. The sample was substantial (n = 935), including hospitals from across all regions of the Netherlands, including teaching, general, and private institutions. A broad range of OR staff roles was included, reflecting the multidisciplinary nature of surgical teams.

Several limitations should be acknowledged. Participation was voluntary, with a modest hospital response rate (43.8%), raising the possibility of selection bias.

The dominance of orthopaedic surgeons, among doctors, likely reflects our recruitment method: all sock scouts were orthopaedic staff members.

Cultural and sartorial norms around socks may differ internationally, limiting generalisability beyond Dutch hospitals

No control group or primary endpoint was set, precluding causal inference. As with all self-reported data, there's a risk of bias, particularly social desirability bias and recall error.

Given the exploratory nature of this study and the number of tests performed, results should be interpreted with caution. Multiple testing increases the risk of type 1 error. We encourage readers to focus on effect sizes and consistent patterns rather than isolated statistical significance.

### *Comparison with Other Studies*

Only one anecdotal previous study touched on sock style in the OR, noting that a dozen senior surgeons preferred colourful or humorous styles [3]. Our study is the first to systematically examine sock choices across all OR staff with close to a thousand participants.

Orthopaedic surgeons have been shown to outperform anaesthetists in grip strength, intelligence and resilience to emotional exhaustion [15,16]. In our study, only differences in gender, age, and shoe size emerged—insufficient to further threaten the already-bruised anaesthetic ego. A result likely to be quietly celebrated in anaesthesiology departments this Christmas.

Anaesthetists were, however, far more likely than orthopaedic surgeons to report that socks served as a form of personal expression—a unique statement. Yet paradoxically, their actual SCALPEL scores—the visual boldness of the socks they wore—were no higher. A theoretical commitment not matched in practice. Another soft blow, perhaps to be discussed over coffee in the anaesthesiology lounge, somewhere beneath the mistletoe—while their orthopaedic colleagues remain scrubbed in.

### *Meaning of the Study/Implications*

Despite surgical protocols and professional restraint, socks remain an important avenue for individual expression in an otherwise highly standardised environment.

Precisely because everything else is regulated, socks stand out.

Our findings highlight how, beneath sterile routines, subtle forms of personal flair persist—quietly challenging the myth of total conformity in the operating room.

## **Conclusions**

In the highly standardised environment of the operating room, socks emerged as a subtle marker of personal expression.

Our findings show that even in a setting defined by conformity, this small detail slips quietly beneath the radar — warming not just feet, but identity.

**Author Contributions:** CV conceived the study. CV and IC contributed to the design, data interpretation, and writing of the article. IC and ME conducted the statistical analysis. The corresponding author (CV) attests that all authors meet authorship criteria and that no others meeting the criteria have been omitted.

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**Data Availability Statement:** Data are available from the corresponding author upon reasonable request.

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**Conflict of Interests:** None declared— though the authors acknowledge having informally assessed colleagues based on their choice of socks in the operating theatre. To their knowledge, no careers were harmed. The senior author is an orthopaedic foot and ankle surgeon, which may account for both his fixation on socks and the

suspiciously high number of orthopaedic participants—raising reasonable concerns about selection bias and thematic tunnel vision. Transparency: CV affirms that the manuscript is an honest, accurate, and transparent account of the study being reported; that no important aspects have been omitted; and that there are no discrepancies from the study as originally planned.

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