A Qualitative Investigation Into the Exercise Habits, Motivators, and Barriers Faced by HealthCare Shift Workers

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Objective: Many healthcare shift workers do not meet recommended physical activity guidelines. As a pillar of physical activity, this study explored exercise habits, motivators, and barriers encountered by healthcare shift workers. **Methods:** Twelve healthcare shift workers in the United Kingdom were interviewed via semi-structured, one-to-one interviews. Data was analyzed using reflexive thematic analysis. **Results:** Healthcare shift workers experience multiple biopsychosocial barriers to exercise, including inconsistent working schedules, psychophysical fatigue, emotionally challenging shifts, and familial commitments. Exercise habits and motivators were highly individualized. Occupational promotion of exercise, including on-site exercise opportunities, education on exercise prescription, and financially incentivized exercise programs were enablers. Time management and planning were crucial for sustained exercise engagement. **Conclusions:** Organizations requiring shift work should promote a breadth of exercise types, and on-site exercise opportunities, at a low economic burden to promote physical activity engagement within their workforce.

Keywords: nonstandard work, physical activity, health behavior, public health, exercise engagement

LEARNING OUTCOMES

- Identify the specific habits, motivators, and barriers to exercise engagement among healthcare shift workers and the factors influencing their behavior.
- Present practical strategies that individuals and workplace organizations can implement to support physical activity engagement in a healthcare setting.

Shift work has become increasingly prevalent in Western and industrialized societies, driven by the growing demand for a 24-hour service society.[1] Shift workers now account for approximately 14% of the workforce in the United Kingdom (UK),[2] marking a rise observed in previous decades.[3] Although there is no consensus definition for shift work, it is generally defined in the UK as "Work activity scheduled outside the standard daytime hours, where there may be a handover of duty from one individual or workgroup to another."[4] Shift work typically takes place in the hours outside 0700–1900 and can include weekends, with work patterns varying from rotating to continuous or discontinuous.[3] Notably, shift work is pervasive across various occupational sectors but holds particular significance in healthcare, whereby round-the-clock service delivery is essential.[4]

Because of unconventional work schedules, shift workers often experience irregular sleeping[5] and physical activity[6] habits. The circadian rhythm regulates fundamental physiological processes (eg, hormone release and metabolism, sleep-wake cycle, and immune function), and thus, circadian desynchronization leads to profound health implications for shift workers, including an elevated risk of cardiometabolic diseases and heightened sleepiness and fatigue, compared with dayshift counterparts.[7–12] Although the adverse health implications associated with shift work are reasonably well established,[7–12] there is a lack of exercise-specific guidance for shift workers concerning mitigating the adverse consequences of their working schedules. Exercise is defined as "Activity requiring physical effort, carried out to sustain or improve health and fitness"[13] and is a major subset of physical activity, which is "Any bodily movement produced by skeletal muscles that requires energy expenditure."[14] Regular exercise engagement is positively associated with improved cardiometabolic function,[15,16] body composition,[16] and sleep quality[17] and is well-recognized as a valuable tool for meeting overall physical activity guidelines.[18] This is of particular significance in shift workers, who face increased risks of circadian misalignment and lower levels of physical activity.[19]

While current physical activity recommendations advocate that healthy adults perform a minimum of 150 minutes of moderate-intensity or 75 minutes of vigorous-intensity aerobic activity per week,[20,21] the majority of shift workers fall significantly short of these guidelines.[6] Indeed, a recent systematic review and meta-analysis reported that shift workers consistently exhibit low levels of physical activity.[22] Further research has shown that healthcare workers have lower leisure-time physical activity but higher occupational activity.[23] This inverse relationship between occupational and leisure-time activity has previously been noted by Chappel et al[24] who found that higher occupational activity resulted in reduced leisure-time activity and vice versa. This bidirectional association highlights the unique interplay between work demands and physical activity outside of work. The complexity of role-specific physical demands hindering motivation for leisure-time exercise makes improving shift workers' physical activity participation a significant challenge. However, shift workers are among those who may benefit most from exercise to increase weekly physical activity and meet recommended guidelines for improved health.[8–13]

Given these barriers, understanding how shift workers may engage in exercise, and further understanding the barriers to such is crucial. For instance, while the demands of shift work and familial commitments often

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hinder exercise participation, some workers adapt by utilizing their flexible daytime hours for physical activity.[25] However, post-shift exhaustion often leads shift workers to prioritize rest or family time over exercise.[25,26] Encouraging shift workers to establish structured exercise habits early in their careers has been shown to improve long-term adherence to physical activity.[27] This is in line with research suggesting that implementing exercise interventions at the beginning of a shift worker's career could enhance long-term health outcomes later in life.[28]

By exploring the factors that enable and hinder consistent exercise engagement in this population, strategies and policies can be developed and implemented to promote exercise adherence and mitigate the negative health consequences associated with shift work.[7–12] Although there is existing literature and interventions aimed at improving exercise engagement and adherence among shift workers, it remains a global challenge, with several barriers such as time constraints and the perception that these initiatives take time away from productive work reported.[29,30] This is particularly noteworthy given that sustained exercise adherence has the potential to not only enhance health, but also reduce economic healthcare burden, lower employee absenteeism, and improve work productivity.[31] To address these research and practical concerns, this study explored the exercise habits, motivators, and barriers encountered by healthcare shift workers through a qualitative research design. From a practical perspective, such findings are essential to subsequently inform the development of tailored exercise interventions that align with the specific needs and desires of this unique population.

METHODS

Research Philosophy

This study was grounded by a pragmatic research philosophy.[32–34] Pragmatism emphasizes the generation of practically meaningful knowledge to address real-world issues faced by individuals within their unique context.[33,35] Ontologically, pragmatism is not committed to a single framework or philosophy[36] and is more concerned with the consequences of inquiry over a particular epistemology.[35] In this regard, the pragmatist selects the research design and methodology that is most appropriate to address their specific research questions and to provide solutions within that context.[33] Given that this research aimed to explore the exercise habits, motivators, and barriers encountered by shift workers, with a specific focus on their experiences, perceptions and preferences, a qualitative and interpretive research design was deemed most appropriate.

Participants

Twelve shift-working healthcare professionals in the UK (9 female, 3 male, consisting of mixed nationality and ethnicity) aged from 21 to 65 years (mean = 35.8 years, ± SD = 16.7 years) were recruited for the study. The sample comprised various healthcare professionals: a paramedic (n = 1), student paramedics (n = 3), an emergency medical technician (n = 1), nurses (n = 4), an emergency nurse practitioner (n = 2), and a senior healthcare assistant (n = 1). Participants worked under different shift patterns and regularity, including rotating shifts that were irregular (n = 9) and permanent shifts that were regular and consistent (n = 3), spanning across day and night. Participants typically worked 2–4 shifts per week, with weekly hours distributed between 21–40+ hours. Participants had been in their current role from 6 months to 10+ years (6–12 months (1 participant), 1–3 years (3 participants), 4–6 years (1 participant), 7–9 years (1 participant), and 10+ years (6 participants) at the time of the interview. As such, we ensured a breadth of chronological ages, years of experience, biological sex, ethnicities, and nationalities within our sample, a strength of reflexive thematic analysis (RTA) research.[37] This diversity was prioritized to capture a broad range of perspectives and lived experiences, rather than a focus on the quantitative size of our sample alone. In line with pragmatic research of this nature,[38] our participant sample was deemed appropriate.

No participants reported pre-existing health conditions or chronic illnesses affecting their ability to exercise. Participants provided written informed consent before participating in this study and were informed that findings would be presented in a pseudo-anonymized format. Ethical approval was granted by the Nottingham Trent University Non-Invasive Ethics Committee (Application ID 1772551). The study was conducted from April 2024 to August 2024. Participant recruitment occurred through posters and social media advertisements. The inclusion criteria for the study required that participants be ≥18 years and currently employed in a healthcare role (eg, nurse, paramedic, doctor) that required shift work.

Data Collection

The first author (CS) interviewed participants one-to-one electronically using an online meeting software (Microsoft Teams, Redmond, WA), with interviews lasting 43 ± 9 minutes. Electronic interviews were selected to minimize travel burden and time limitations with participants (who were geographically distributed throughout the UK) and to best fit around their unsociable and rotating shift patterns. Electronic interviews allow for the collection of comprehensive data while ensuring a positive participant experience.[39] Participants were interviewed using a semistructured interview guide consisting of open-ended questions with relevant follow-up prompts. The interview guide was piloted with one shift worker (emergency nurse practitioner, 10+ years within the healthcare system), and following pilot testing, several minor revisions were made to the interview guide, such as restructuring the order of the interview questions.

The design of the interview guide was informed by relevant literature and the authors' research and practical experiences in health, exercise, and occupational settings. The interview questions were created to identify the habits, motivators, and barriers to exercise engagement, with the main questions followed up with prompts to evoke further elaboration. Participants were provided with an exercise definition "Activity requiring physical effort, carried out to sustain or improve health and fitness"[13] after providing their definition of the word. The semistructured interview guide has been presented in Appendix A (see Appendix A, SDC 1, http://links.lww.com/JOM/B939, which shows the interview guide used).

Data Analysis

Data were analyzed using the six-phase approach to RTA outlined by Braun and Clarke.[38,40] RTA was deemed as the most appropriate analytical method as we aimed to explore and understand shift workers' habits, motivators, and barriers to exercise, with a specific focus on their experiences, perceptions and preferences. In the first phase of analysis, the first author listened to the audio recordings of each interview, noting further reflections and insights in a reflexive journal (see subsequent section for further detail). After listening to each interview recording at least once, the first author manually transcribed each interview verbatim. Following transcription, audio recordings were then listened to again to confirm transcription accuracy. These processes were conducted to ensure familiarization with the data.

In the second phase of analysis, data was systematically open-coded with a 'bottom-up' approach with a focus on producing both semantic (eg, shift duration) and latent (eg, compromised self-care due to personal responsibilities) codes. While coding was predominantly 'bottom-up,' deductive coding (eg, reduced exercise motivation) was also conducted, primarily to ensure that the codes and subsequent themes were relevant to the specific research question. A qualitative analysis software (QSR-NVIVO-14) was used to assist in this process.

In the third phase, the codes were then grouped together to generate initial subthemes (eg, 'inconsistent shift patterns' and 'shift

length' became 'shift patterns'; 'lack of sleep' and 'fatigue from shifts' became 'recovery challenges') that shared an underlying concept.

In the fourth phase, initial themes were reviewed in relation to the overall dataset. At this phase, LS acted as a 'critical friend'[38,40] and sense-checked and challenged the generated themes and subthemes of CS. In line with RTA, this process was both collaborative and flexible, rather than binary or autocratic; a process to further deepen interpretations of data and explore further potential meaning, rather than to achieve a consensus of meaning.[38,40] This process, by nature, also enhanced the trustworthiness of data.[38,40] Following this process, several revisions were made to the analysis. As an example, the subtheme 'shift patterns' was deemed not representative of the true issue being that participants expressed that the irregular shift patterns and the duration of such shifts significantly inhibited their perceived ability to exercise. As such, 'shift patterns' was broken down into 'irregular shift patterns' and 'shift duration.'

Phase five involved the final review, defining and naming of the codes, subthemes and themes. As such, the subthemes and themes were compared against the data to ensure that they were truly representative of what was being said, capturing the connections between the codes, subthemes, and themes. The final phase was the write-up of the study.

Trustworthiness

In addition to the critical friend approach outlined in the preceding section, the first author kept a reflexive journal throughout the data collection and analysis.[38,40] During interviews, the first author recorded initial reflections, observations, and key discussion points; a method to begin immersion in the data, but also to spark reflection and further discussion points within the interview. During data analysis, the author would revert back to these reflections when interpreting and coding data and also when challenged during the critical friend process.

RESULTS

Upon completing the analysis, four overarching themes were generated ("Occupational Constraints," "Biopsychosocial Motivators," "'Organizational opportunities," and "Habits and Current Knowledge"), which are presented with their subthemes and raw data examples in Table 1. In the following subsections, we present the themes and subthemes from the analysis, with exemplar quotations from participants (P) throughout.

Occupational Constraints

Scheduling and Time

The irregularity of the occupational shift patterns posed a significant and recurring challenge for participants that hindered their perceived ability to exercise: 'our shift patterns and the fact that there is no actual pattern...it can be quite hard to fit the exercise in' – (P4 – Emergency medical technician). This was echoed by P6 (Senior healthcare assistant): 'We never know what shift pattern we've got and that's very hard. It stops us being able to plan or agree to anything because it's consistently changing... no two weeks are the same.' This barrier was exacerbated by the lack of breaks during the working shift itself: 'Some days we don't even get a break. So, you are just dead on your feet, so there is no chance I'm going to be able to go out and exercise' – (P6 – Senior healthcare assistant). Notwithstanding the lack of breaks at work, the duration of the shift was perceived as a further barrier: 'You know the shifts; four shifts' times 12 is obviously a 48-hour week and then that could very easily turn into, Yeah, 55 to 60 hours…squashed into 4 days is a lot.' – (P1 – Paramedic).

The lack of time stemmed not solely from the inherent occupational constraints of participants' roles, but was further intensified by the necessity to attend to personal matters outside of working hours: 'I belong to a gym... but I haven't been in about a year because when I'm working, I don't have time, and when I'm off, I've got things to do that I didn't have time for when I'm working' – (P7 – Nurse). Consequently, in the absence of regular breaks and consistent working schedules, exercise can become a lower priority in this population.

Work Demands

Shift-related fatigue was a significant barrier to exercise, highlighted by all participants: 'You're physically and mentally exhausted. So, you don't want to do anything after [the shift]' – (P6 – Senior healthcare assistant). This was reiterated by P2 (Student paramedic): 'After nights, there is no chance in hell I'll be going out to exercise. I'm dead to the world.' This was emphasized by P10 (Nurse): 'If I'm working a twelve-and-a-half-hour shift, it's quite hard to go [and exercise] the next morning because you're so knackered from working such a long shift.' Several participants reported that the emotional carryover from the shifts combined with the taxing nature of the role itself made it difficult to be motivated to exercise, especially after unpleasant or emotionally draining experiences: 'If you've had just like a really bad shift and you've had really horrible patients and you've been abused at work or whatever, you don't want to exercise, all you want to do is just go home and just chill' – (P4 – Emergency medical technician). This was echoed by P11 (Student paramedic): 'I've had jobs where unfortunately children have been really, seriously unwell, and leaving that shift, I might want to go to the gym in the morning, but actually, I felt quite low, and I just wanted to go home.'

Recovery Time

The design of shift work, often leading to sleep deprivation, was frequently mentioned as a barrier to exercise. When perceived fatigue from shift work was high, participants gave precedence to rest and recovery over exercise: 'Exercise and fitness takes like a back foot and sleep becomes my most important kind of thing [when fatigued]... I'd rather sleep more and exercise less'– (P3 – Student paramedic). The inconsistent sleep schedules associated with shift work exacerbated this problem, as participants noted experiencing minimal rest between shifts: 'It's extremely common that I'll get literally 2 or 3 hours of sleep before that first shift...exercise just goes out the window' – (P3 – Student paramedic). Combined, these findings show how the combination of long shifts, irregular sleeping patterns and the associated fatigue inhibit shift workers' perceived opportunities to exercise.

Social Context

Familial commitments were a significant time commitment and barrier to exercise. Childcare responsibilities could make it hard to exercise: 'When I didn't have children, it was easier, and I did used to go to the gym and exercise regularly. Now, fitting in everything with the children, all their schedules, I lost that motivation.' – (P8 – Emergency nurse practitioner). Similarly, P6 (Senior healthcare assistant) could only exercise if their partner was available to support: 'I could only go [to the gym] if my husband at the time was home to look after the kids. If he was late working, I couldn't go.' These findings show the social complexity of exercise adherence, whereby the social environment can complicate exercise participation.

Although some participants felt that familial responsibilities were a barrier to exercise, for others, it was a motivator to exercise and an opportunity to spend quality time with their children: 'I get to spend time with the children if we're walking or biking… for me, that is a big motivation' – (P9 – Nurse). These findings further underscore the complexity of exercise adherence in this population, whereby some found that their families facilitated exercise participation, while for others, familial responsibilities acted as a barrier.

Biopsychosocial Motivators

Physical Health

Physical appearance was a significant motivator for participants to exercise: 'Looking good in general is a big motivator. I think if I'm

TABLE 1. Habits, Motivators, and Barriers to an Exercise Routine Experienced by Shift Workers

Overarching Themes	Themes	Sub-Themes	Examples of Raw Quotes
Occupational constraints	Scheduling and time	Irregular shift patterns	'There's a lot of time constraints which sort of limit how much exercise you can do, so flipping between days and nights and days and nights takes it out of you a lot.' – P3 (Student paramedic)
		Lack of work breaks	'Whether staff would [exercise] during their breaks, I don't know. I mean, a lot of the time, you don't get your full breaks.' – P12 (Emergency nurse practitioner)
		Shift duration	'So my gym that I go to now, it's only open from about 6:00 till about 10:00 o'clock at night and some of the shifts we do, they might finish at around 8:00 or 9. By the time I get to the gym, I've probably only got half an hour maybe if I'm lucky.' – P11 (Student paramedic)
		Lack of time	'So you're coming off one shift, you've got shopping to do, you might have a meeting to go to, you might have your dental appointment and you have to try and fit exercise into that as well. You don't have time.' – P8 (Emergency nurse practitioner)
	Work demands	Shift-related fatigue	'it's quite hard to [exercise] the next morning because you're so knackered from working such a long shift if it's really busy, the last thing you think of is getting up again early in the morning to go to the gym and like we don't really have the energy.' – P10 (Nurse)
		Unpleasant shifts	'Yeah, it like depends what happens on the shift 'cause I personally work with children, so like I don't know if something bad happened that would really affect how you feel and then might not be in the mood to [exercise].' – P10 (Nurse)
	Recovery time	shift-design fatigue	'So it's quite hard to kind of get into that body clock of look, I'm going to night shift. I should probably do some exercise beforehand, but I know I need to sleep before, so it's kind of weighing up the balance. Like, what do you prioritize, exercise or sleep.' – P3 (Student paramedic)
		Rest periods	'After nights you obviously need that rest day. It's about getting to sleep to then be able to just get up the following day for a shift.' – P5 (Nurse)
	Social context	Familial commitments	'When you've got children to pick up from school all you want to do is get out of work so you can go get them, then there's kids clubs, training, etc. just when are you meant to fit in the time [to exercise].'- P7 (Nurse)
Biopsychosocial Motivators	Physical health	Exercise for appearance	'Looks really. I suppose that's what I'm driven by…it's to look good basically.' – P3 (Student paramedic)
		Exercise for physical health	'I think it's just an overall health health thing, you know. I used to play a lot of sports when I was younger, kind of being in that. Just maintaining a good level of fitness.' – P3 (Student paramedic)
		Injury prevention and job performance	'We deal with a lot of falls and also we deal with really obese patients that we have to roll… So yeah, so we do a lot of carrying equipment and manual handling patients and things like that, so [exercising] definitely helps.' – P4 (Emergency medical technician)
	Psychological factors	Mental health benefits	'That mental well-being. Like like in the nature of the job can have like an impact on your mental health. And so [exercise] is just like a pick me up, makes me feel better. Like releases endorphins.' – P10 (Nurse)
		Role models	'I just think practice what you preach. You know, we go on about, you know, being healthy and looking after your health and your heart and that and then you don't exercise.' – P5 (Nurse)
Organizational opportunities	Workplace initiatives	Allocated exercise time	'Yeah. I mean, I think [allocated exercise time] would, but I think you also have to consider the realities of the of the job as well.'– P11 (Student paramedic)
		On-site facilities	'So yeah, [on-site facilities] is a great idea and I think it would really help people and I think it would be great for their well-being. I think it would also make people want to come to work more and stay in the healthcare organization.' – P4 (Emergency medical technician)
		Lack of policies	'No, they once did like a walking program for people that was years ago, but I don't know of any exercise program.' – P8 (Emergency nurse practitioner)
		Group exercise initiatives	'I mean, exercising, in my opinion, should be a social thing. I'm the most motivated by exercise when there's a social aspect to it…bringing a teamwork aspect to it as well, you know, but I can see that impacting quite nicely on sort of on the road stuff, building friendships.' – P3 (Student paramedic)
		Financial cost	'Yeah, and the [exercise] classes I do actually do a 20% off [with a blue light card], which I think is really good 'cause it is really expensive as well. So that does always motivate shift workers.' – P10 (Nurse)
		Gym accessibility	'Yeah, the fact that the gym isn't open at that time [after work]…or if you're trying to work out in your house, you know, we had a bunch of weights last year trying to make do.' – P3 (Student paramedic)
		Perceived safety	'Like it's dark when you get up. It's dark when you come home. So I certainly wouldn't [exercise in the dark].' – P5 (Nurse)

Habits and current knowledge	Knowledge	Education	'Definitely something that's evidence-based, I think is quite important because you know it's a medical profession…Like handouts. Just this is efficient and works well and these are exercises that you can… we recommend you do this and you know something like that would be quite helpful.' – P3 (Student paramedic)
		Lack of understanding	'Definition of exercise. It is something that you do above and beyond your normal walk into the shops or walking downtown, or it's just something that's above or beyond your normality.' – P7 (Nurse)
	Exercise perception	Exercise location	'At the moment, it's the gym and riding my bike outside… I have also done CrossFit at the gym before.' – P1 (Paramedic)
	Individual strategies and behavioral patterns	Exercise activity	'So outside of my weight training, I'll go to some of the gym classes, like spin…the gym puts on hit classes as well, so I go to some of those.' – P11 (Student paramedic)
		Social and independent exercise	'I go to Pilates with a friend and then me and a friend sometimes swim together but, I mainly go on my own and he might come with me like once a month… When I was going regularly to the gym, I'd always go with a friend like and we just got a little bit obsessed and motivated each other so it's good going with someone else.' – P5 (Nurse)
		Exercise duration	'I'll probably say like 30 to like 60 minutes or something like that kind of to be like, oh, I've gotten my body moving, a bit of sweat.' – P2 (Student paramedic)
		Exercise planning	I have to plan when I'm gonna go to the gym… So a lot of organization and planning is needed for when I'm on shift.' – P11 (Student paramedic)

completely honest you know, it's one of the biggest… and that does influence the type of exercise that I try and do,' – (P3 – Student paramedic). P5 (Nurse) expressed similar motivations: 'When I got really obsessed with the gym…it was probably then motivating for appearance.'

Beyond physical appearance, participants discussed how they felt a need to exercise to combat the known negative physical health consequences of shift work: 'Working nights is really bad for your long-term health… it shortens your life so a lot of that [exercise] is trying to combat that really' – (P1 – Paramedic). P9 (Nurse) expressed the harmful effects of inactivity seen in their patients as a personal driver: 'What I've seen [inactivity] does to your health from being in the acute areas of work… we know if you don't move the detrimental things that happen to your body.' Moreover, the need to be in an appropriate physical condition to meet the physical demands of the occupation and prevent injury was a significant motivator for many: 'I go to the gym to make sure I can pick up heavy patients…another motivation is I can be caught out with an injury from work and that takes me out of the gym' – (P11 – Student paramedic). P1 (Paramedic) summarized this motivation: 'We need to be able to be, you know, be fit and as strong as you can to do my job properly… If I need to be able to physically carry people out of buildings, which we do every day… it's dangerous for the patient if I'm not able to do that.' These findings demonstrate how the physical nature of shift work acts as both a motivator and a barrier to exercise, depending upon participants' context and perspective.

Psychological Factors

Exercising for positive mental health was noted as a key driver, helping participants to cope with the stressful nature of their roles: '[exercise] makes me feel better. I know my body, I can get in bad headspaces without it' – (P9 – Nurse). Similarly, P4 (Emergency medical technician) discussed the motivating and stress-relieving effects of exercise: 'Seeing changes and the positive effects on my mental health [as a result of exercise] motivates me to go [to the gym]…and like the stress relief. Furthermore, participants outlined how the need to act as role models for patients was a psychological driver for exercise engagement: 'It's quite hypocritical... how can you tell people to exercise if you can't manage [to get up] the stairs?' – (P2 – Student paramedic). For these healthcare shift workers, exercise was a way to promote positive mental health, reduce work-related stress, and act as patient role models.

Organizational Opportunities

Workplace Initiatives

Participants discussed how the workplace itself could be more proactive in promoting exercise adherence. For example, P1 (Paramedic) suggested that 'allocated exercise time at work' would help to address the time and accessibility constraints that shift workers face, adding, 'I spend easily 50% of my waking consciousness at work and if you've not got the ability to exercise in those 4 days… that's already half of your life that's then not accessible [to exercise].' Some participants discussed the need for on-site exercise facilities: 'If a staff member had accessibility to go to the gym [on-site] straight before or after a shift, it would be great.' – (P8 – Emergency nurse practitioner).

Because of the lack of occupation-based exercise policies, some workers started their own walking groups: 'We started just a long walk like nothing strenuous, because the idea was like everyone could attend.' – (P5 – Nurse). These group-based initiatives were expressed as a favorable, low-cost alternative to on-site facilities: 'I think if there was an opportunity for [group exercise], I'll definitely jump on it… like group classes, I'll definitely try and take part in stuff like that' – (P2 – Student paramedic).

The majority of participants discussed financial barriers to exercise and the need for more economically inclusive options: 'With the cost of living crisis… I think that [healthcare staff discounts] would probably help because for me that was a deciding point on what gym that I went to.' – (P4 – Emergency medical technician). P9 (Nurse)

expressed frustration with the current healthcare shift worker discounts, suggesting that larger incentives would make gym memberships more accessible: 'The discounts on like blue light cards [A discount card for UK emergency service workers that offers discounts on products and services], I think it'll be really good to actually incorporate a much bigger sort of scheme or discount code for people. There's such a variety of different incomes out there that we need to address for all different prices and accessibility.'

Accessibility of exercise facilities was another barrier faced when trying to maintain an exercise routine, with P1 (Paramedic) sharing their frustration around limited gym opening hours: 'Even if I could wake up at 3:00 in the morning and go and work out for an hour… they are physically not open.' To combat financial constraints and limited accessibility to facilities, some of those who did exercise would often do it at home, free of cost: 'The Pilates I do, I just do the YouTube videos at home so I could do that whenever I wanted' – (P12 – Emergency nurse practitioner). Perceived safety was another concern complicating exercise participation for some participants, particularly given that free time outside of work may coincide with the nocturnal period: 'There's definitely safer times that you just feel more motivated to go, but also comfortable to go.' – (P9 – Nurse). In fact, P12 (Emergency nurse practitioner) no longer exercised at night due to a perceived lack of safety: 'I wouldn't do it [exercise at night] because I wouldn't feel safe.'

Habits and Current Knowledge

Knowledge

Although participants recognized the health risks associated with inactivity, they also recognized gaps in their knowledge. They expressed a strong need for educational, evidence-based resources that offer a clearer understanding of exercise prescription to guide their exercise habits and achieve the desired health outcomes from physical activity. This suggests that such resources could enhance their exercise engagement by clarifying the types, durations, and frequencies of exercise necessary to achieve health benefits. P4 (Emergency medical technician) stated: '99% of us work on evidence-based care… anything that's got evidence, we're more likely to follow.' Similarly, P9 (Nurse) stressed, 'Everything I do, and my colleagues do is evidence-based... if we had the evidence base, we wouldn't be so confused all the time.' Therefore, providing clear evidence-based support and guidance for shift work health interventions is essential. Without such clarity, individuals may interpret exercise differently, potentially impacting behavior and adherence to interventions aimed at increasing weekly physical activity.

Exercise Perception

Participants demonstrated significant variation and confusion in how they defined 'exercise' and the prescriptions to achieve the desired health benefits. In this regard, no two participants defined it the same way. P5 (Nurse) defined exercise as 'doing something physical for some sort of benefit, whether it be fitness benefit, mental health benefit, or yeah, just to make yourself feel better", with P12 (Emergency nurse practitioner) defining it as "Physical work like you're running, something that makes you lose weight, feel fit, gets you out of breath". This inconsistency reveals a knowledge gap that could influence how shift workers approach physical activity and exercise and highlights the need for tailored educational resources. This was highlighted by P9 (Nurse) 'I think educational materials would be really good, and signposting resources would be the best way to provide information to nurses or health professionals… I personally would be 100% behind any evidence-based promotion of well-being for us.'

Individual Strategies and Behavioral Patterns

Exercise activities engaged in by participants varied, with a mix of gym-based and outdoor activities. Gym-based workouts like weightlifting, spin classes, high-intensity interval training, and Pilates were common but outdoor activities, particularly walking, running, and cycling were also frequently mentioned: 'Normally I would go to the gym, but... a lot of it has been outdoors activities for me so runs, cycling, walking.' – (P3 – Student paramedic). Similarly, P9 (Nurse) highlighted this outdoor appeal: 'It needs to be different surroundings, different environment, fresh air. I don't like being inside unless it's for weights.' Resistance training was frequently cited as a favorite indoor exercise, with P4 (Emergency medical technician) sharing, 'I really enjoy [lifting] weights... you'll never catch me running.' However, participants seemed to prefer variety: 'It has to be variety. It can't be the same thing every week for me.' – (P9 – Nurse). Exercise sessions ranged from individual, to with a friend or family member, to group classes and exercise sessions. Regardless of exercise preference, sessions usually lasted between 30–60 minutes and varied between before-shift or after-shift sessions, or loading exercise exposure to non-work days; this was a highly individualized matter.

For those who did maintain a consistent exercise routine, organization, pre-planning and goal setting were essential: 'You have to be strict with your time management and that's what you learn during the role… and then it's just yeah, having that organization' – (P12 – Emergency nurse practitioner). The importance of a consistent exercise routine was also outlined: 'I always try and go in the morning or like at a set time... So that sort of helps me with my routine.' – (P4 – Emergency medical technician)

DISCUSSION

The findings of this study show that healthcare shift workers face multiple barriers to maintaining a consistent exercise routine. While shift workers generally appear to understand the benefits of exercise, many lack a deeper understanding of how to consistently and appropriately engage to achieve the desired health benefits. Lengthy shift durations and inconsistent shift patterns, exacerbated by fatigue characterized by the shift itself, present major perceived obstacles to exercise. The emotional toll of shift work, along with personal and family commitments, hinder the perceived ability to make time for exercise. The habits and motivators to exercise were highly individual and influenced by a range of biopsychosocial factors, highlighting the complexity of exercise adherence within this population.

Occupational constraints, including irregular shift patterns, shift duration, and insufficient breaks impeded the ability of participants to maintain an exercise routine. These findings are in line with Nea et al,[26] who showed that inconsistent shift schedules and long shift durations impeded the ability of shift workers in Ireland to engage in regular exercise. Kelly et al[41] also reported similar findings in 1300 Irish shift workers, whereby a lack of work breaks was associated with a reduced likelihood of exercising. Combined, these findings illustrate that the occupational constraints of shift work are significant barriers to exercise, primarily driven by inconsistent working schedules and elongated shift durations. Indeed, a lack of time has been reported as a barrier to exercise across broader contexts[42,43] and in shift work specifically in non–healthcare occupations.[26,41,44–46]

These occupational constraints, coupled with the physical exertion of the shift itself, meant that participants reported frequent perceptions of fatigue. This fatigue encompasses both sleep and task-related fatigue, which although distinct,[47] participants did not differentiate between, but often perceived as synonymous. Psychophysical fatigue was reported as one of the main reasons why participants felt that they could not consistently engage in exercise. Given that fatigue from shift work has consistently been reported as a significant barrier to exercise,[25,26,45] our findings are somewhat unsurprising in this regard. Furthermore, this may also explain why our participants and those in other studies of similar contexts (eg,[25,26] reported prioritizing sleep over exercise as a mechanism to combat shift-related fatigue. Interestingly, findings from the current study suggest the individual's ability

to plan and organize their schedules effectively was key in facilitating exercise opportunities, underscoring the importance of time management skills. In addition, stressful or traumatic shifts significantly inhibit sleeping and as a result, overall motivation to exercise. This work-related stress significantly reduces exercise motivation in shift workers.[26]

Given that our participants reported a consistent lack of exercise and constant psychophysical fatigue, these factors may contribute to the rising prevalence of mental health issues reported among healthcare shift workers.[26,48–50] Balancing fatigue with personal and work commitments can create a vicious cycle of sleep deprivation,[51,52] which may explain the avoidance of exercise.[46] However, for those participants who did exercise, it was reported as alleviating stress and minimizing mental health burden.[53,54] If shift work occupations value promoting positive health among employees from a biopsychosocial perspective, implementing exercise programs within the healthcare setting is crucial.[55]

Although this study focuses solely on healthcare shift workers in the UK, the overlap between the current study and previous research on shift workers[26,45] suggests that barriers to exercise extend across multiple industries. Addressing shift workers' physical and psychological fatigue is crucial to enable sustained motivation to exercise and for employee and patient safety.[56] Targeted exercise interventions can improve sleep among shift workers,[17] which can have a positive effect on acute and chronic fatigue.[57] This is significant given that these were reported as primary concerns by participants in the present study. Tackling these occupational constraints can potentially reduce healthcare costs, improve workforce productivity, and reduce absenteeism.[31] As such, occupational organizations should recognize that exercise benefits go beyond physical and nonwork-related factors and can positively influence work-related performance. Improving exercise adherence of staff will not only improve employee well-being but will also likely improve organizational outcomes and patient safety within the healthcare industry.

In an attempt to mitigate barriers to exercise, participants discussed how the lack of accessible on-site exercise facilities must be addressed. One immediate solution may be local sports club/gym membership partnerships that offer healthcare shift worker discounts. Indeed, Nea et al[26] suggest that discounted access to on-site gym/exercise facilities can be effective in facilitating a consistent exercise routine. The provision of workplace exercise initiatives (eg, group exercise classes and department physical activity programs) was suggested as a pragmatic starting point. Programs of this nature have been pilot-tested elsewhere and present promising results at relatively low economic cost.[58] This provision, combined with staff education, is likely to make any intervention more effective.[59] However, while such interventions are often effective in the short term, it is important to recognize that with the unique challenges that the shift workers reported, the motivation over time may decrease, affecting the long-term impact. Holtermann et al[30] advocate that designing the job to promote health may be a more sustainable approach, suggesting that work should be structured to provide an optimal amount of physical activity that promotes health and physical capacity without leading to overexertion or an emphasis on exercise alone. Such programs could offer a sustainable starting point for integrated workplace wellness initiatives. They not only account for the time constraints and energy levels that are often a primary barrier to consistent exercise among shift workers, as seen in the current study, but also contribute to increased overall weekly physical activity, potentially improving employee health in the long term.

Furthermore, recent work by Shriane et al[60] has demonstrated the value of participatory co-design methods in developing tailored health and well-being resources for young shift workers. This project was driven by academics and co-designed by experienced shift workers to create experience-driven resources that improve physical activity through various means. It allowed the resources to be informed by literature and the unique, real-world experiences of shift workers, highlighting the importance of co-designing tailored interventions with academics and individuals who have practical experience. This research directly supports our findings, which revealed a significant gap in participants' knowledge regarding exercise definitions and prescriptions. Although participants were provided with a definition of exercise after their personal definition, their responses to the interview questions appeared to blur the distinction between structured exercise and general physical activity. This further suggests a need for ongoing education not only to reinforce these definitions and prescriptions, but also to support healthcare workers in integrating both structured exercise and other forms of beneficial physical activity into their routines, ultimately promoting improved health outcomes.

By engaging shift workers in the development process, educational resources can be better tailored to address the specific ambiguities and inconsistencies observed around exercise in the current study. In this way, integrating tailored, co-designed interventions not only validates the call for personalized health education highlighted in our results but also offers a promising pathway for enhancing long-term adherence to exercise among shift workers. Additionally, It is also essential to implement proactive interventions for adults entering shift work, as early interventions promoting health and well-being in young adulthood have demonstrated longer-term health benefits.[28] This is particularly important given the link between early exposure to shift work and poor health outcomes by middle age.[27] Shriane et al[60] supports the argument that health education for shift workers should extend beyond traditional approaches, incorporating participatory methods to ensure resources are fit for purpose and engaging for the target audience.

Outside of the occupational context, there are broader barriers to exercise in this population. Familial commitments, specifically childcare responsibilities, present significant time constraints and additional fatigue in those with children. These familial responsibilities including school drop-offs, household duties, and late-night care, can exacerbate sleep deprivation.[25] Such findings have been reported elsewhere in food services, health and social care, and manufacturers.[26,45,53,61] Exacerbated sleep deprivation can lead to increased psychophysical fatigue, which was a primary barrier to consistent exercise engagement as well as others.[35,39,43] Therefore, this lack of sleep from familial commitments may diminish motivation to exercise, perpetuating a cycle of exercise avoidance. To try to mitigate this, some participants relied on their wider familial network for childcare support, making exercise more feasible. Others navigated this barrier by exercising with their family, utilizing this as an opportunity. Therefore, interventions aimed at supporting exercise among shift workers should consider family-friendly initiatives or programs that cater to those with childcare responsibilities.

Positive self-perceptions of physical appearance were primary exercise motivators, in line with previous findings in healthcare workers[53] and the general population.[62] Similar to prior research,[53] serving as a role model for others was an additional motivation to exercise, suggesting that internal and external perceptions of the self are significant influences. Interestingly, shift workers may also use exercise as a tool to build physical resilience and stamina specifically required for their occupation. This is particularly relevant as healthcare roles are known to be physically demanding due to the need to run, lift, and move patients or equipment,[63] which can lead to an increase in musculoskeletal injuries, adversely affecting job performance and patient safety.[64] This underscores the importance of physical fitness in meeting occupational demands.

Many participants highlighted the positive role socializing has in adhering to their exercise routines. Similarly, Demou et al[58] demonstrated that group-based interventions designed for the unique schedules of shift workers effectively promoted weight loss and enhanced exercise adherence. Key components of these interventions included classes or competitive group activities, fostering a motivating and friendly competitive environment, individualized goal setting, and financial incentives to boost motivation and commitment, which align with our findings. Employers should leverage the benefits of social engagement to promote exercise adherence among staff.

It should be acknowledged that this study did not distinguish between sleepiness and task-related fatigue, as they were interlinked based on all 12 participants' responses. Furthermore, the sample in this study was predominantly female healthcare staff within the UK and findings may not be generalizable to other shift-working industries, the broader healthcare workforce, or those outside the UK. Although most of the participants in this study had been in a healthcare role for over 7 years, the wide range of participants' tenure could have influenced the opportunities and experiences faced. As mentioned previously, while a clear definition of exercise was provided to participants, our findings suggest that the distinction between structured exercise and general physical activity remained somewhat ambiguous in practice. This highlights the complexity of how shift workers conceptualize and engage in physical activity within their daily routines. As such, individual interpretations and lived experiences may have influenced how participants categorized their physical activity, potentially affecting the way they reported their exercise habits in this study.

Future research could benefit from distinguishing between sleepiness and fatigue to better identify cause and effect, as well as to develop targeted countermeasures. This also highlights the need for educating shift workers on the differences between these two states. Nevertheless, a lack of regular exercise remains an issue among shift workers, highlighting the need for targeted interventions.[6] Given that familial commitments and time are significant barriers to sustained exercise, the efficacy of work-based exercise programs/opportunities and child-friendly exercise interventions warrant further research.

In conclusion, the findings of this study offer insights into the factors that affect exercise adherence in healthcare shift workers. These findings highlight the intricacy of designing effective exercise interventions and demonstrate that the barriers to exercise in this population are complex and biopsychosocial. While this study specifically focuses on exercise, it is important to recognize that exercise is a subset of physical activity. Broader physical activity, such as occupational and leisure-time physical activity, also contributes to improving health outcomes in shift workers. Tailored interventions must be adaptable, offering options that accommodate varying schedules, preferences, and social dynamics. However, there are key themes that must remain consistent: relatively short duration, a location on-site or in close proximity, minimal financial burden, and promotion by the occupational organization itself. In the absence of these factors, any intervention is unlikely to be effective in the long term.

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