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PHYSICAL ACTIVITY AND HEALTH

Workplace Physical Activity Within the Gulf Cooperation Council Region: A Scoping Review

REVIEW

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ABSTRACT

Objectives: To identify and examine available literature addressing physical activity (PA) and sedentary behavior (SB) in the workplace in the Gulf Cooperation Council (GCC) region.

Design: Scoping Review

Method: Academic and gray literature databases were searched for studies published prior to April 2021. Only studies conducted in the GCC region, available in Arabic or English, and addressing workplace PA were included.

Results: Ten studies were identified; seven intervention studies, a cross-sectional study, a peer-reviewed brief report, and a 5-year strategy document. For the interventional studies, duration ranged from 3–26 weeks. Interventions delivered varied and included those focusing on multiple behaviour (diet and physical activity), walking challenges, and supervised exercise in paid time. Most included behavior change strategies like prompts, incentives, and education. PA was only measured in four intervention studies with most reporting no significant changes. The one study that reported significant changes from a national workplace walking challenge had a less robust study design and methods making these results difficult to interpret. Studies were hampered by poor study design and reporting of research and intervention details. Two studies reported hot weather and lack of time as barriers to workplace-PA in the GCC region.

Conclusions: Literature on workplace PA and SB interventions in the GCC region is limited. Well-designed studies using standardised measures are required to assess PA interventions in GCC workplaces. Further, higher quality research is required to assess motivators and barriers to workplace PA in the GCC to develop sustainable workplace PA interventions.

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INTRODUCTION

Non-Communicable Diseases (NCDs) constitute 71% of all death caused annually worldwide (World Health Organization, 2018). Insufficient physical activity (PA) and excessive sedentary behaviour (SB) are positively associated with NCDs (Patterson *et al*., 2018). Research has demonstrated that sufficient PA is a vital contributor to overall physical and mental health (Ramji *et al*., 2020). Physical Activity is defined as any form of physical movement that is generated by the skeletal muscles and demands energy expenditure (Caspersen, Powell and Christenson, 1985). For health in adults, government guidelines recommend performing moderate-intensity aerobic exercise for at least 150 minutes per week, or alternatively high-intensity exercise for 75 minutes per week, or a combination of both (Public Health England, 2022). This includes incorporating strength and balance training two days per week and reducing sedentary time (Bull *et al*., 2020). Still, at least 27.5% of the global adult population does not attain these minimum PA recommendations (Global status report on physical activity, 2022; McCarthy and Warne, 2022; Wafi *et al*., 2022) with only 10–30% meeting the minimum muscle-strengthening guidelines (Bennie, Shakespear-Druery and De Cocker, 2020). In addition, prolonged sitting (>10–12 hrs per day) may pose health risks independent of the amount of physical activity performed, so health may still be compromised despite meeting recommended PA guidelines (Burton and Coyle, 2021).

The constant technological advancement in high-income countries reinforces the reduction of daily physical movement (Kahan, 2015). This is observed in the countries of the Gulf Cooperation Council (GCC), which includes Kuwait, Bahrain, Qatar, Saudi Arabia, the United Arab Emirates (UAE), and Oman. With a total area of 2,673,108 km^2 and an estimated combined population of 58.4 million (Al-Marzouqi and Arabi, 2022), the GCC region has undergone massive economic growth alongside an immense technological evolution in the past 40 years (Al-Hazzaa, 2018). The Human Development Index (HDI) for the GCC countries is ranked fairly high globally; ranging from 26^{th} for the UAE to 54^{th} for Oman out of 191 countries (United Nations Development Programme, 2022) with a reported total Gross Domestic Product (GDP) of $2 trillion in 2022 (World Bank, 2022). In the GCC region, obesity (Nikoloski and Williams, 2014), NCDs, (Aggarwal *et al*., 2020) and premature deaths are some of the most prevalent diseases (Raad, 2015). The GCC has higher levels of physical inactivity (46.24%) than the global average (27.5%) (Alqahtani *et al*., 2021) and is considered a major risk factor for NCDs within the region (Fadhil *et al*., 2022). Only 39% to 42.1% of male adults and 26.3% to 28.4% of female adults in the GCC countries met the global recommended PA level (Mabry *et al*., 2016). Additionally, sedentary behaviour has become socially patterned in the GCC as a result of rapid economic development and living standards changes (Benajiba *et al*., 2020) and is concurrent with the rise of obesity and associated health problems (Hashem *et al*., 2019). There are few studies evaluating lifestyle health behaviours in the GCC (Hashem *et al*., 2018). Also, research on PA levels in the Middle East remains uncertain due to disparities in methods of assessment, while outcomes should be interpreted with prudence given the high incongruity between measuring criteria (Chaabane *et al*., 2020).

Several obstacles to PA have been identified in the literature, including conservative cultural norms such as gender roles, particularly towards women discouraging them from participating in PA in some Arab communities because of strong patriarchal constructs (Musaiger *et al*., 2014). Also, lack of peer support and low self-efficacy are social and psychological barriers, respectively (Alsubaie and Omer, 2015). Other identified barriers within the GCC include the hot arid climate (Al-Hazzaa, 2018) and the employment of domestic helpers who perform most of the household tasks (Chaabane *et al*., 2021), which exacerbate prolonged sedentary behaviour. Insufficient PA can be observed in the workplace setting where sedentary behaviour, defined as low energy expenditure in a reclined or seated position (Tremblay *et al*., 2017), predominates particularly among employees with desk-based jobs (Owen *et al*., 2010). Although PA strategies are found to be beneficial to the overall health and performance of employees, adopting them can be hindered by various social and economic impediments (Ryde *et al*., 2020).

While investigating the physiological and psychological health effects of sedentary behaviour on workers has arguably begun, exploring appropriate work-based exercise interventions simultaneously continues to be a research pursuit (Sundstrup *et al*., 2020). The purpose of this scoping review is to identify and examine the literature addressing PA in the workplace in the GCC region, including interventions to increase PA.

METHODS

SEARCH STRATEGY

The literature search was carried out from 1 March 2021 to 1 April 2021. Eight electronic databases were used for the search including searching the grey literature: Scopus, PubMed, SpringerLink, Wiley Online, ProQuest, ScienceDirect, ResearchGate, and Google Scholar. A search applied the following terms that mainly described the population, intervention, location, and country, in consequent combinations to refine results: "Workplace" or "Workers" or "Employees" or "Staff" AND "Physical Activity" or "PA" or "Exercise" or "Training" or "Workout" AND "Intervention" or "Programme" or "Guideline". Gulf Cooperate Council countries were defined as the 6-member Arab States of the Gulf and were included in the earlier search combination as follows: "Bahrain" or "Kuwait" or "Oman" or "Qatar" or "Saudi Arabia" or "United Arab Emirates" or "Gulf Cooperate Council" or "GCC". Academic, policy and practice sectors in Kuwait were contacted for relevant research; including in-person visits to Public Authority for Sports (PAS), Ministry of Public Works (MPW), Ministry of Health (MOH), Kuwait University (KU), Dasman Diabetes Institute (DDI), and Kuwait Foundation to the Advancement of Science (KFAS) to search for all possible documents in relation to PA in the workplace. Reference lists from the retrieved literature were manually reviewed for related studies. In addition, authors with a particular interest in the topic were also searched for and their publications were reviewed for relevance (Figure 1).

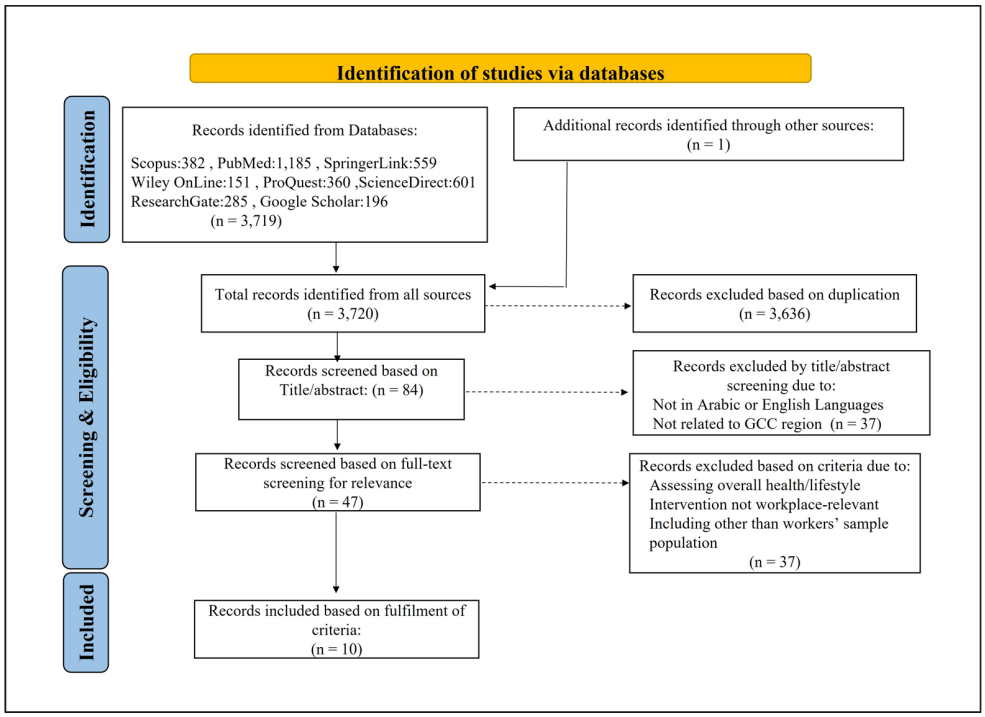

Figure 1 Illustration of literature search process.

INCLUSION AND EXCLUSION CRITERIA

Only GCC-relevant articles published in Arabic and English languages were considered. The titles and abstracts of all published papers were examined for relevance. Workplace-focused studies on PA aiming to increase physical activity and/or used PA as a primary intervention or as part of multiple behavioural interventions for employees were included. The sample population was 18 years and older and the criteria were independent of gender, ethnicity, or presence of health issues. All types of PA assessment (e.g., activity diary, pedometer, accelerometer, and questionnaire) and all reported outcomes were eligible for inclusion. Since the available number of the GCC-relevant studies is limited, no study design was excluded and all grey literature (e.g., government reports, policies, guidelines, presentations, working papers, statements, plans, newsletters) that addressed workplace-related PA were included.

DATA EXTRACTION AND ANALYSIS

Titles and abstracts were screened by A.K. Eligible citations were imported into EndNote Reference Manager, version 20 (Thomson Reuter, Philadelphia, PA) and retrieved for full-text

review. A.K. examined full texts against the inclusion/exclusion criteria. Discussions between all authors were held periodically to ensure article eligibility and all full texts were also screened by an independent reviewer (X.W.). Data was extracted from the retained studies and charted into a Microsoft Excel Sheet [Microsoft Excel, 2021] in which the detailed list included study ID, country, year of publication, worksite type, study objective, study design, intervention duration, intervention characteristics and behaviour change techniques, participant demographics, outcomes, and main findings. In addition, the participation rate for the number of employees invited against the number of those participated was examined using the following formula:

$$Study\ Participation\ Rate = \frac{Number\ of\ Participants}{Total\ Number\ Invited} \times 100$$

RESULTS

RESULTS OF THE SEARCH

Altogether 3,720 records were identified from all sources. After removing a total of 3,636 duplicates, the titles and abstracts of 84 papers were reviewed. Of these, full texts of 47 were reviewed in more detail for eligibility and ten fitted the inclusion criteria (Figure 1).

STUDY DESIGN AND CHARACTERISTICS OF INCLUDED PUBLICATIONS

Not all included publications were intervention studies. The study by Al-Mohannadi et al. (2020) was cross-sectional and aimed at identifying the motivators and barriers to PA participation among staff members in a hospital setting in Qatar using a survey. This also included details of a pilot study on a smaller subsample preceding the preliminary cross-sectional study to validate the reliability and consistency of the survey. An article by Alkhatib (2015) was a peer-reviewed brief report highlighting the prevalence of NCDs in Qatar and proposing specific places, including worksite settings for multifaceted strategies to reduce the national levels of disease, recommending various approaches for research. Further, a 5-year strategy document created by Behbehani (2014) for the national programme of healthy living in Kuwait, referring briefly to the importance of embracing a healthy environment in the workplace, was included. As a result, the actual number of workplace-related studies within the GCC region that incorporated PA interventions were seven in total. Details of these seven studies are shown in Table 1. The intervention studies include two RCTs (Tomar and Allen, 2016a, 2016b) of the same intervention looking at two outcomes with a longitudinal follow-up in one (Tomar and Allen, 2016b), and a pre-post longitudinal trial (Altwaijri *et al*., 2019) from Saudi Arabia, a cross-sectional pre-post intervention with a follow-up longitudinal component (Al-Mohannadi *et al*., 2019) from Qatar, a feasibility trial (Loney, Carter and Linnane, 2012) from UAE, a pre-post study (Al Saweer, Salehi and Al Tiho, 2017) from Bahrain, and finally a protocol for an RCT in the workplace (Alrahma *et al*., 2021) from UAE that was postponed because of the COVID-19 pandemic.

DESCRIPTION OF INTERVENTION PROGRAMMES

Variability in PA programmes delivery and content was evident across all seven intervention studies with interventions typically poorly described (Table 2). One study (Tomar and Allen, 2016b) examined the effect of PA on musculoskeletal symptoms. Two studies (Al Saweer, Salehi and Al Tiho, 2017; Altwaijri *et al*., 2019) adopted a multiple behaviour intervention targeting the overall wellness of employees which comprised several components, including PA, nutrition, and stress relief/mental health related activities. Five studies focused on PA alone. Three of these (Alrahma *et al*., 2021; Tomar and Allen, 2016a, 2016b) delivered both aerobic and resistance exercises with the others focusing specifically on aerobic activity. Two of these (Tomar and Allen, 2016a, 2016b) included non-supervised physical activity while the other (Alrahma *et al*., 2021) planned to provide supervised exercise during paid work time. Of those that focused solely on aerobic activity, one delivered a walking challenge (Al-Mohannadi *et al*., 2019), and the other (Loney, Carter and Linnane, 2012) had walking challenges in addition to changes to the physical office environment such as mini trampolines, Swiss-balls, and stretching areas. Most provide some sort of additional behaviour change strategy, like incentives (Al Saweer, Salehi and Al Tiho, 2017; Al-Mohannadi *et al*., 2019) email or text prompts, and education/health advice (Tomar and Allen, 2016a, 2016b; Al-Mohannadi *et al*., 2019).

REFERENCE (AUTHOR, DATE, COUNTRY, REFERENCE NUMBER)	STUDY DESIGN	AIM	STUDY SIZE (#INVITED, # PARTICIPANTS, RATE, GENDER, AGE)	INTERVENTION (DURATION, DETAILS)	ASSESSMENT TOOL(S) / OUTCOME MEASURE(S)	FINDINGS
Tomar & Allen 2016 (a) **KSA**	Randomized Control Trial	Examine PA effect on depression, work ability, physical and physiological parameters post-intervention	n = 52 n = 30 57.7% M 27–57 years	12-wk 30min run 1/wk – Max HR 65%, 75%, 85% wks 1–4, 5–8, 9–12. 8 resist 1/wk – Intensity 1RM 60%, 70%, 80% wks 1–4, 5–8, 9–12,	PHQ-9, WAI, BP, HR, BF%, Lipid prof, FBS, BMI	Sig. decrease: depression ($P = 0.035$), LDL ($P = 0.016$), TC($P = 0.027$), BF% ($P = 0.001$), BMI ($P = 0.01$), HR ($P = 0.036$). Non-sig. differ: WAI, BP, HDL, VLDL, TG, Fast BS, BP
Tomar & Allen 2016 (b) **KSA**	Randomized Control Trial	Assess PA effect on prevalence of musculoskeletal symptoms (MSS) 6-mth follow-up post-intervention	n = 52 n = 30 57.7% M 27–57 years	12-wk Aerobic 1/wk – 30min run 1/wk and Resist 1/wk – front delt press, chest, pect fly, abs, bi, tri, leg curl/extension	NMQ, PHQ-9, WAI, BP, HR, BF%, Lipid prof, FBS, BMI	Non-sig differ in MSS and most parameters except depression ($P = 0.011$), FBS ($P = 0.021$) and LDL ($P = 0.050$)
Loney et al. 2012 **UAE**	Feasibility Trial	Feasibility to implement PA into work schedule without interfering	n = 24 n = 24 100% M,F 24 – 55 years	3-wk: daily/weekly PA (contests). Walking challenge. Hydration day, Yoga day, Eat healthy day	Pedometer	Non-sig ($P = 0.063$) increase: PA level & step count. Pedometer is useful tool to increase PA
Alrahma et al. 2021 **UAE**	Randomized Clinical Trial Protocol	Assess if PA improves cardio-metabolic risk markers and PA level	n = 75 NA	12-wk: 2x1hr PA/wk Supervised sessions during work hours resistance & aerobic	BP, WC, LDL, FBS, BMI, NCDs, HbA1c, IPAQ, Accelerometer	Not applicable
Al-Mohannadi et al. 2019 **Qatar**	Pre-post-intervention cross-sectional surveys (Observational)[1]	Assess impact of walking challenge on PA level	n = 800 n = 194 (Post-surv) 24.3% n = 54 (Pedometer) 6.8% M,F 35–44 years	3-mth: national walking challenge Step into Health,	SF-36v2, IPAQ, WSQ, Pedometer	Sig. increase: step count (34%); increase: PA & MET min/wk; higher PA engage post-study, low overall increase, men more active
Altwaijri et al. 2019 **KSA**	Pre-post Longitudinal[2]	Employee wellness programme to improve the overall health	n = 53 n = 32 60.4% M,F 21–≥60 years	6-mth: module/mth Fitness sessions, Holistic Nutrition, Breath & Meditate, Yoga, Vegan Diet, Mental Health	BMI, BF%, MusF%, SCE, Survey: SF-36, HDQ, WCQ	Sig. improvement: Physical function ($P = 0.004$), Diet ($P = 0.01$); No sig. differ.in BC, overall health, workplace PA & characteristics
Al Saweer et al. 2017 **Bahrain**	Pre-post	Introduce programme to maintain healthy lifestyle	n = 97 n = 97 100% M,F 46.3 years (Average)	6-mth: 150min/wk PA, nutrition clinics, weight-loss plan, dental care, vaccination, periodic examination, stress mediation	BMI, BP, Lipid Profile, FBS, HB, HADS, Lifestyle, Med check & Record, PA measure unclear-'regularly exercising'.	Decrease: obesity, BP, Fast BS, TC, sick leave, stress (35%); Increase: PA (12%) Improved diet

Table 1 Workplace Physical Activity Interventions in GCC region.

SF-36v2: Short Form 36 health survey **IPAQ:** International Physical Activity Questionnaire **WSQ:** Workforce Sitting Questionnaire **PHQ-9:** Patient Health Questionnaire **WAI:** Work Ability Index **HDQ:** Healthy Diet Questionnaire W**CQ:** Workplace Characteristics Questionnaire **HADS:** Hospital Anxiety and Depression Scale **BMI:** Body Mass Index **WC:** Waist Circumference **BF%:** Body Fat Percent **MusF%:** Muscle Fat Percent **BP:** Blood Pressure **HR:** Heart Rate **FBS:** Fasting Blood Sugar **HbA1c:** Glycated Hemoglobin **HB:** Hemoglobin **LDL:** Low-Density Lipoprotein **NCDs:** Non-Communicable Diseases **SCE:** Stair Climb Exercise **NMQ:** Nordic Musculoskeletal Questionnaire.

[1] Unclear study design: Potentially repeated cross-sectional with pre-post measures.

[2] Unclear study design: Potentially pre-post unsure if observational or they set up the intervention themselves.

INTERVENTION FORMAT					BEHAVIOURAL STRATEGIES					
STUDY	**MULTPLE BEHAVIOURS**	**AEROBIC ACTIVITY**	**WEIGHTS**	**SUPERVISED**	**PROMPTS**	**PA IN PAID TIME**	**SOCIAL SUPPORT**	**INCENTIVES**	**EDUCATION**	**GOAL SETTING**
Tomar & Allen 2016 (A) KSA	No	Yes	Yes	No	Yes – Leaflets, posters & Emails. Diary. HR-monitor	Yes	No	No	Yes – Lectures on intervention wk 1 & 6	No
Tomar & Allen 2016 (b) KSA	No	Yes	Yes	No	Yes –Leaflets, posters & Emails. Diary. HR-monitor	Yes	No	No	Yes –Lectures on intervention wk 1 & 6	No
Loney et al. 2012 UAE	No	Yes	No – M Yes – F	No – M Yes – F	Yes – Seminar Posters, signages, Emails, banners & Leaflets. Exercise tools in office & building. Pedometer	Yes	Yes – Executives Participate	No	Yes – Materials in posters & leaflets forms	Unclear
Alrahma et al. 2021 UAE	No	Unclear	Unclear	Yes	Unclear	Yes	Unclear	Unclear	Unclear	Yes – hanging cardio-metabolic risk factors baseline to end
Al-Mohannadi et al. 2019 Qatar	No	Yes	No	No	Yes – Tips Emails & text msg Pedometer	Yes	Yes – Group joining & data sharing	Yes	No	Yes – Promoting behaviour change & Managing PA
Altwaijri et al. 2019 KSA	Yes	Yes	No – M Yes – F	No – M Yes – F	Yes – Emails, articles, healthy putlock, Posters & Calendar	Yes	Yes – Motivational Emails. walk w/chairman, cumulative Points from challenges.	No	Yes – Experts' Sessions, lectures, Films, workshops, interactive sessions	Yes – Improve: work stress, satisfaction productivity absenteeism health, PA & diet
Al Saweer et al. 2017 Bahrain	Yes	Unclear	Unclear	Unclear	Yes – Healthy snacks & vending machine, gym discount,	Yes	No	No	Yes – Smoking cessation workshops	Yes

Table 2 Interventions and Strategies of the Reviewed Studies.

The duration of interventions varied between studies, ranging from 3 to 26 weeks. Participants' age ranged from 21 to over 60 years. Four studies included both male and female participants (Loney, Carter and Linnane, 2012; Al Saweer, Salehi and Al Tiho, 2017; Al-Mohannadi *et al*., 2019; Altwaijri *et al*., 2019). two studies of the same intervention recruited a sample of males only (Tomar and Allen, 2016a, 2016b) and one did not specify sex or gender (Alrahma *et al*., 2021). Participation rates varied widely among studies ranging from 6.8% to 100%.

ASSESSMENT TOOLS AND OUTCOME MEASURES

A range of measures for PA and SB were used and included both subjective methods and activity devices. For the subjective measures, physical activity levels were assessed in two studies (Al-Mohannadi *et al*., 2019; Alrahma *et al*., 2021) using the International Physical Activity Questionnaire (IPAQ; Sjostrom *et al*., 2005). Al Saweer, and co-authors analysed how 'regular exercisers' changed but did not describe how exactly they measured this change. Another recorded daily activity using diaries and daily logs (Al Saweer, Salehi and Al Tiho, 2017). In terms of device measures, daily step count was measured using pedometers in three studies (Loney, Carter and Linnane, 2012; Al-Mohannadi *et al*., 2019; Altwaijri *et al*., 2019). Accelerometers were planned to be used in the protocol RCT (Alrahma *et al*., 2021).

A range of other outcomes was also measured. One study (Altwaijri *et al*., 2019) evaluated lower body strength, power, physical function, bodily pain, energy/fatigue, social functioning, emotional well-being, role limitation because of the physical/personal/emotional problems, and general health using (RAND 36-Item Health Survey 1.0, SF-36) (Ware and Sherbourne, 1992). The same study evaluated performance by a stair climb exercise, examined daily diet habits with a healthy diet-related questionnaire, and assessed work characteristics including productivity, satisfaction, stress, and absenteeism through a related questionnaire.

Quality of life and sedentary behaviour were assessed by Al-Mohannadi *et al*., (2019) using Health Survey Short Form-36 version 2 (SF-36v2) (Kurklu *et al*., 2015) and Workforce Sitting Questionnaire (WSQ) (Chau *et al*., 2011). Al Saweer, Salehi and Al Tiho (2017) measured anxiety and depression symptoms, which the authors termed 'stress', using the Hospital Anxiety and Depression Scale (HADS) (Zigmond and Snaith, 1983). While, the two studies by Tomar and Allen (2016 a, b) measured depression without anxiety, and workability level using Patient Health Questionnaire (PHQ-9) (Spitzer, Kroenke and Williams, 1999) and Work Ability Index (WAI) (Tuomi *et al*., 2017), respectively. With respect to the study investigating workplace barriers and motivators, Al-Mohannadi *et al*. (2020), applied a tailored questionnaire.

EFFECT OF INTERVENTIONS ON PHYSICAL ACTIVITY OUTCOME

Only four studies (Loney, Carter and Linnane, 2012; Al Saweer, Salehi and Al Tiho, 2017; Al-Mohannadi *et al*., 2019; Altwaijri *et al*., 2019) out of the total six interventions reported change in PA as an outcome. Three of these studies assessed changes in step counts. A walking challenge with changes to the physical office environment (Loney, Carter and Linnane, 2012) showed a non-significant increase in daily step count (1483 ± 3450, $P = 0.063$). The delivery of a national community step count challenge Step Into Health (Al-Mohannadi *et al*., 2019) delivered in a workplace context showed a significant but small increase in overall average daily steps during the intervention compared to pre-intervention (9270 ± 672 steps per day, $P = 0.048$) but 3 months post-intervention steps were no different to pre-intervention levels. This study did report significant changes in IPAQ data including total PA (22 minutes per week) 3 months post-intervention but due to the poor study design (pre-post cross-sectional study) these results should be interpreted with caution. One study targeting multiple behaviours and a more holistic intervention (Altwaijri *et al*., 2019) showed a non-significant difference in average steps per week during work time (2224 ± 5413, $P = 0.07$). The study that did not measure step count (Al Saweer, Salehi and Al Tiho, 2017) reported changes in the number of people classed as being 'regular exercisers' per week. This multiple behaviour intervention providing a wide range of opportunities to change health behaviours showed an increase in regular exercisers of 12%. However, they did not provide any formal statistical analysis and exactly how PA was measured is unclear.

EFFECT OF INTERVENTIONS ON NON-PHYSICAL ACTIVITY OUTCOMES

For other non-physical activity outcomes, four studies conducted body measurements. One (Al Saweer, Salehi and Al Tiho, 2017) showed a significant decrease in obesity and another (Tomar and Allen, 2016a) showed a significant reduction in both body mass index ($P = 0.01$) and body fat percentage ($P = 0.001$). The other two (Tomar and Allen, 2016a, 2016b) found no significant difference in body compositions at the end of intervention compared to baseline, even at six months post-intervention in Tomar and Allen (2016b). Mental health of employees was evaluated by three studies. Depression scores were significantly reduced in two studies (Tomar and Allen, 2016a, 2016b) ($P = 0.035$ and $P = 0.011$, respectively); but showed a non-significant difference in the Work Anxiety Index (WAI). The third study (Al Saweer, Salehi and Al Tiho, 2017) reported that stress levels were lower by 35% post-intervention. The examination of serum parameters in three studies produced inconsistent results; with one (Al Saweer, Salehi and Al Tiho, 2017) showing significant overall improvement while others (Tomar and Allen, 2016a, 2016b) found mostly no effect. Another study (Altwaijri *et al*., 2019), indicated no change in the overall health of workers by the end of the intervention.

MOTIVATORS AND BARRIERS TO PHYSICAL ACTIVITY IN THE WORKPLACE

Qualitative findings in relation to motivators and barriers to exercise were reported in two of the non-intervention studies (Alkhatib, 2015; Al-Mohannadi *et al*., 2020). Barriers to the interventions were also reported as limitations in four of the intervention studies (Tomar and Allen, 2016a; Al Saweer, Salehi and Al Tiho, 2017; Al-Mohannadi *et al*., 2019; Altwaijri *et al*., 2019). The two most commonly reported barriers to physical activity in workplace were "work demand" and "hot weather" as noted by a cross-sectional study (Al-Mohannadi *et al*., 2020) and also reported in the peer-reviewed brief report (Alkhatib, 2015). "Hot weather" was also a main limiting factor in two intervention studies (Al Saweer, Salehi and Al Tiho, 2017; Al-Mohannadi *et al*., 2019). Al-Mohannadi et al. (2020) also reported cultural norm responsibilities, particularly for women prioritizing family roles and committing to take care of others as potential barriers to being active. Three of the intervention studies reported facing similar cultural norms as limiting factors to their interventions (Tomar and Allen, 2016a; Al-Mohannadi *et al*., 2019; Altwaijri *et al*., 2019). The two non-intervention studies reported "maintaining weight" to be one of the main motivators for participating in workplace PA (Alkhatib, 2015; Al-Mohannadi *et al*., 2020).

DISCUSSION

The purpose of this scoping review was to identify and examine the literature addressing workplace physical activity in the GCC region. This review found few studies addressing this topic, and those that were reported were highly variable in study type, methods, and outcomes of interest. The lack of physical activity research in the context of the workplace in the GCC is surprising given the need for increasing PA in the region and the amount of PA research within other non-workplace settings in the area. Mabry et al. (2016) conducted a systematic review investigating PA and SB research in oil-producing countries of the Arabian Peninsula included 100 studies, none of which focused on PA in the workplace. They highlighted that domain specific research is 'urgently needed' due to recent shifts in transportation and occupational patterns in the region. Another review published in 2020 on the PA interventions in 22 Arabic speaking countries around the GCC reported another 19 PA intervention studies from 2016 to 2018 (Benajiba *et al*., 2020). Only three were in the workplace (two also included in the present review). Combined with the findings from this review, the workplace as a setting in which to intervene and improve PA in the GCC is still to be further explored.

Future work in this area should also aim for high-quality research where possible: From the literature that was available in this review, only six were intervention studies and in general, these were hampered by less robust study designs, methods, and insufficient reporting regarding study design, previous research had suggested that whilst conducting a true RCT in the workplace can be challenging for several reasons (e.g. because of the high risk of contamination), researchers should investigate ways to deliver a more robust study design where possible and potentially with a control group (Ryde *et al*., 2020). This can include working in collaboration with workplaces themselves and those responsible for delivering health and positive health behaviours to balance the research and the delivery of the intervention. For

measurements, there were attempts to use either validated self-report scales of PA or device measures of PA such as pedometers. This was not across all studies and results for PA change were difficult to interpret with few positive results reported. Regardless of the lack of change in PA, some outcomes demonstrated some positive change (mainly weight, work-related outcomes, and mental health) but it is unclear the influence of PA on these outcomes due to design and measurement issues.

All intervention studies in this review included a physical activity aspect yet, the mode, intensity, and frequency of PA programmes as well as the duration of exercise sessions varied across studies. Nevertheless, when aiming to deduce what PA interventions might be successful in workplaces in the GCC this review can provide some insight. The intervention studies in this review typically involved different forms of low-moderate physical activity (e.g., walking, running <85% of MHR, yoga, stair climbing, weight-training ≤80% of 1RM, etc.). Such interventions have been shown to have positive implications on mental health, work absenteeism (Laux *et al*., 2020), and cardiovascular health (Mulchandani *et al*., 2019); which were reported by three included studies (Tomar and Allen, 2016a, 2016b; Al Saweer, Salehi and Al Tiho, 2017). However, no effect was observed in most lipid profile measurements and some cardiovascular parameters in Tomar and Allen (2016 a, b), which might be due to uncontrolled behaviour outside the workplace. Moreover, no improvement in overall health was shown in one study (Altwaijri *et al*., 2019) where the lack of a control group and perquisite assessment might have contributed. These contradictions make clear conclusions difficult.

Studies in this review also used aspects of behaviour change techniques including informational approaches; behavioural and social practices in which PA is increased through goal setting, peer support, and self-reward; and environmental and policy approaches involving transforming the workplace physical environment and infrastructure into a more activity-friendly by adding walking paths, fitness facilities, etc.

Although poorly reported in the included studies, complementing PA interventions with such approaches for better outcomes has been emphasized and supported by a recent systematic review and meta-analysis (Mulchandani *et al*., 2019). In general, with the limited amount of intervention studies available, and the heterogeneity of the delivered interventions in this review drawing conclusions about effective interventions is difficult. Potentially using co-creation to find out what people want to do with regards to PA in the GCC might be an approach for future research in this area.

Other aspects of intervention implementation should also be considered. The length of interventions in the current review and in recent relevant work-based reviews (Grüne *et al*., 2020; Lucas, Wade and Wagstaff, 2020; Mänttäri *et al*., 2021) is neither specified nor restricted (Grimani, Aboagye and Kwak, 2019), with divergent durations that ranged from 3 weeks (Loney, Carter and Linnane, 2012) to 12 weeks (Tomar and Allen, 2016a, 2016b; Al-Mohannadi *et al*., 2019; Alrahma *et al*., 2021) and six months (Al Saweer, Salehi and Al Tiho, 2017; Altwaijri *et al*., 2019). Although it is logical to assume better outcomes from longer durations as suggested by one intervention study in this review (Altwaijri *et al*., 2019), the length of intervention alone might not necessarily be an essential effect moderator (Dawson *et al*., 2020). The systematic review by Galante *et al*. (2021) found longer programmes resulted in a slightly lower benefits than their shorter counterparts. Similarly, in the current review, one 12-week study by Tomar and Allen (2016 a, b). The authors found significant positive effects on BMI and body fat percentage than 6-month study (Altwaijri *et al*., 2019). Moreover, the latter study showed no improvement in body composition, PA levels, overall health, and workplace characteristics while the other six-month study (Al Saweer, Salehi and Al Tiho, 2017) displayed more favourable outcomes in the same variables. Research on whether a longer intervention duration is better than a shorter one or vice versa needs further investigation.

The inclusion of an adequate follow-up period is essential to assess the long-term effect and the behavioural sustainability of interventions (Chen *et al*., 2020). Of all studies in the current literature review, only Al-Mohannadi *et al*. (2019) included a follow-up in the form of a questionnaire one-month from baseline but did not report the feedback. Many studies in similar reviews lacked follow-ups (Benajiba *et al*., 2020; Chaabane *et al*., 2020; Grüne *et al*., 2020; Mänttäri *et al*., 2021). Moreover, follow-up periods found in similar literature reviews varied greatly from three weeks (Johnson *et al*., 2018) to eight years (Grimani, Aboagye and

Kwak, 2019). To accurately assess the impact of an intervention promoting workplace health, a follow-up of at least 3–6-months has been suggested (Wells *et al*., 2000) to allow time for behavioural change to occur (Grimani, Aboagye and Kwak, 2019). Also, most studies in this review lacked control groups (Loney, Carter and Linnane, 2012; Al Saweer, Salehi and Al Tiho, 2017; Al-Mohannadi *et al*., 2019; Altwaijri *et al*., 2019). The control groups are essential elements in relevant research to validate the effect of interventions and to draw meaningful conclusions (Malay and Chung, 2012).

This review also suggests that studies assessing barriers and facilitators to workplace-related PA in the GCC area are limited, with two articles on this included in the review (Alkhatib, 2015; Al-Mohannadi *et al*., 2020) in addition to four intervention studies reporting specific barriers interfering with their PA interventions (Tomar and Allen, 2016a, b; Al Saweer, Salehi and Al Tiho, 2017; Al-Mohannadi *et al*., 2019; Altwaijri *et al*., 2019). Similar barriers reported in the current review have also been noted in reference to improving a healthy lifestyle for the overall population in Qatar (Donnelly *et al*., 2011).Other non-workplace research addressing physical activity barriers has found lack of time, limited knowledge of PA benefits, cultural norms, and gender-related obstacles towards females (Al-Nakeeb *et al*., 2015; Al-Mohannadi *et al*., 2019) to be frequent constraints. A recent systematic review by Chaabane *et al*. (2021) aiming at synthesizing barriers and facilitators to physical activity in 20 Middle East and North Africa (MENA) countries including Kuwait, Qatar, UAE, Bahrain and Oman, suggested that the absence of proper training facilities, lack of time, limited social support and motivation, gender and cultural norms, unpleasant climate, and high weather temperature are among the most common barriers. Additionally, growing older, married, female, and having a lower level of education were reported as major socio-demographic factors negatively correlated with PA participation in the MENA, including GCC region. Other reviews (Mabry *et al*., 2016; Benajiba *et al*., 2020; Chaabane *et al*., 2020) have reported similar findings. Although these reviews and global observations (World Health Organization, 2019) report men to be more active than women, higher participation among females than males are reported in at least half of the studies in the current review. This suggests the workplace might be a setting in which some of these potential cultural barriers could be overcome.

Nonetheless, there is undoubtedly a research gap when investigating the barriers and motivators of promoting workplace PA in the GCC region in addition to the limited studies addressing physical activity in the workplace. Moreover, employees' cultural context and socioeconomic status may impact the participation rate and should be measured when conducting such studies. Non-national employees are reported to comprise about two- third of the total workforce in the GCC region (GCC-STAT, 2020). Only two studies in the current review identified the participants' backgrounds (Loney, Carter and Linnane, 2012; Al Saweer, Salehi and Al Tiho, 2017), with one using nationality as a variable in examining ambulatory activity (Loney, Carter and Linnane, 2012). Still, data on PA distinguishing nationals from non-nationals in the GCC is limited, and more demographic research is required to understand PA behaviour for the development of an effective public health program (Al-Mohannadi *et al*., 2019; Chaabane *et al*., 2020). Consequently, barriers and motivators for non-national employees might be dissimilar to GCC-national employees.

Interestingly, Kuwait was the only GCC country that has neither fulfilled any national strategy/guideline to increase PA or reduce SB nor proceeded with its 5-year national programme for healthy living (Oguoma *et al*., 2020). All other GCC countries, including Oman (Al Siyabi *et al*., 2021), have addressed PA and SB, particularly in the workplace and each is currently working on establishing a national strategy to promote PA. Therefore, research needs to carefully investigate the reason(s) why Kuwait is the only GCC country that is falling behind on this, as well as try to determine what strategies might be better suited for Kuwait to promote active living with more emphasis on workplace-related PA.

CONCLUSION

The published literature on workplace PA and SB in the GCC area is limited. Interventional studies were impeded by less robust and inadequately reported research designs. PA programmes differed among the relevant studies and had variable outcomes. Hence, the evidence is inadequate to determine what works versus what does not in a workplace setting in the GCC

area. The insufficient volume of PA and SB data in the GCC region and the high prevalence of NCDs in adults suggest that workplace PA interventions should be explored as a feasible approach to improving overall PA levels and reducing SB. Also, Interventional studies need to be well-designed for more useful comparisons. Finally, GCC-related barriers and motivators for workplace PA should be considered in future research to help in developing appropriate and effective interventions for the region.

COMPETING INTERESTS

The authors have no competing interests to declare.

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