

## Self-Management: A New Eight-Minute Stretching Program for Employees with Musculoskeletal Disorders (MSDs)

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### Abstract

Musculoskeletal disorders (MSDs) are the main cause of workplace injuries. MSDs are health problems that attack the body's propulsion systems, such as muscles, tendons, ligaments, joints, cartilage, and nerves. This study aims to determine the effectiveness of Self-Management: A New Eight-Minute Stretching Program against MSDs in a company X, Tangerang, Indonesia. A quantitative, quasi-experimental research method using a non-equivalent control group pre-test-post-test design was conducted on 90 respondents, who were divided into two sample groups by using side probability with a simple random sampling technique. The MSD risk measurement instrument used the Nordic Musculoskeletal Questionnaire. The results obtained showed that the majority of respondents were adults (51.3%), male (67.2%), and had more than three years of working experience (43.7%). The results of a Mann-Whitney U test found that there were differences in the level of complaints about MSDs between the intervention group and the control group ( $p = 0.00$ ). However, using Wilcoxon, there were differences in complaints about MSDs during the pre-test and post-tests ( $p = 0.00$ ). Based on the research results, it is suggested that every company provide continuous education to employees so that they can implement this program independently while working or at home. This prevention can reduce complaints of MSDs, so that, together with reduced complaints, the quality of health will improve.

**Keywords:** effectiveness, employees, musculoskeletal disorders

### Abstrak

**Manajemen Diri: A New Eight-Minute Stretching Program terhadap Musculoskeletal Disorders (MSDs) pada Karyawan.** Musculoskeletal disorder (MSDs) merupakan penyebab utama kecelakaan di tempat kerja. MSDs adalah masalah kesehatan yang menyerang sistem alat penggerak tubuh, seperti otot, tendon, ligamen, sendi, kartilago dan saraf. Penelitian ini bertujuan untuk mengetahui efektivitas Manajemen Diri: A New Eight Minute Stretching Program terhadap Musculoskeletal Disorders (MSDs) pada karyawan di perusahaan X, Tangerang, Indonesia. Penelitian ini menggunakan desain kuantitatif dengan metode quasi-experimental menggunakan non-equivalent control group pre-test-post-test design terhadap 90 responden yang terbagi menjadi dua kelompok sampel. Pengambilan sampel menggunakan side probability dengan teknik simple random sampling. Instrumen pengukuran risiko MSDs menggunakan kuesioner the Nordic Musculoskeletal. Hasilnya didapatkan mayoritas responden berusia dewasa (51,3%), laki-laki (67,2%), lama kerja lebih dari tiga tahun (43,7%). Hasil dari uji Mann Whitney ditemukan perbedaan tingkat keluhan MSDs antara kelompok intervensi dan kelompok kontrol ( $p = 0,00$ ); sedangkan dengan menggunakan uji Wilcoxon ditemukan perbedaan keluhan MSDs saat pre-test dan post-test ( $p = 0,00$ ). Berdasarkan hasil penelitian disarankan setiap perusahaan memberikan edukasi pada karyawan secara kontinu untuk menerapkan program ini secara mandiri saat bekerja ataupun di rumah. Program ini dapat mengurangi keluhan MSDs, seiring dengan berkurangnya keluhan tersebut maka kualitas kesehatan akan meningkat.

**Kata Kunci:** efektivitas, karyawan, muskuloskeletal disorders

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## Introduction

Musculoskeletal disorders (MSDs) are the main causes of injuries and disabilities in the work-

place. The World Health Organization (WHO) defines MSDs as disorders or health problems that attack the body's propulsion systems, such as muscles, tendons, ligaments, joints, cartilage,

and nerves (Soylar & Ozer, 2018). A MSDs is an injury or pathological disorder that disrupts the normal functioning of the soft tissues in the musculoskeletal system. MSDs occur when the soft tissues experience stress or injury that occurs continuously, repeatedly, and gradually so that eventually the soft tissues will be damaged (Shuai et al., 2014).

According to WHO data, the incidence of MSDs is estimated to account for 60% of all work-related illnesses. As of 2014, the rate of cases of MSDs in male employees was 37.5 per 10,000, compared to the female employees' rate of 29.7 per 10,000 (Joshi et al., 2014). MSDs occur in the US due to various activities or types of work. In 2015, the incidence of MSDs was recorded at 29.8 cases per 10,000 workers, 80 of whom were in the industrial sector. The recovery period for this illness was around 12 days, and the impact on companies caused increased treatment costs for workers (Joshi et al., 2014).

Based on a report of the European Commission (2014), cases of MSDs cause 49.9% of absences from work (unable to work for more than three days), and 60% of cases of permanent disability at work. In 2010, 22,013 cases of occupational disease were reported in Argentina, with MSDs being the most common occurrence. MSDs in Korea experienced a very high increase, from 1,634 in 2001 to 4,502 in 2010 (Hutting et al., 2019). According to Seeberg et al. (2019), the annual cost of MSD cases reaches up to USD 1 trillion per year. Among employees, MSDs are an economic burden that must be borne by the government, especially in the healthcare system (Seeberg et al., 2019).

According to a report by the International Labor Organization (ILO), of the nearly 160 million work-related disorders occurring around the world annually, MSDs are the second most common occupational disease (Nuraydin et al., 2018). MSDs have been defined as inflammatory and degenerative conditions that affect muscles, tendons, ligaments, joints, peripheral

nerves, and supportive structures, such as intervertebral discs (Davey et al., 2019). These problems comprise a wide variety of disorders, including those that differ in intensity and symptoms and can result in mild and moderate symptoms or chronic and disabling conditions (Labao et al., 2018).

Tangerang, one of the supporting cities for the capital of Indonesia, has the country's largest number of industrial sectors. According to data from the administration of a company X, a well-known company engaged in the production of popular sports shoes (Adidas), the company currently employs 9,000 workers. The data results of the report show that the top 10 diseases or conditions that are handled and reported monthly by the company's clinic are myalgia, MSDs, pharyngitis, enteritis, bronchitis, cephalgia, conjunctivitis, hypertension, and hypotension, which the clinic's lab consultant associates with cholesterol, sugar, glyceride, and uric acid. MSDs are in second place, which means that the majority of sick worker visits are due to MSD cases.

Sustained MSDs will affect both the employees themselves and the company where they work. Hutting et al. (2019) recommended several strategies to deal with MSD problems, including providing policies for the health aspects of the company. These include providing healthy and balanced food, periodic health checkups (general checkup), the provision of rooms and sports facilities, stretching, healthy lifestyles, and so on. Apart from company policies, employees can implement self-management strategies to overcome MSDs (Hutting et al., 2019).

A self-management strategy is an intervention method to improve fitness and restore and improve the health of employees who have MSD problems or prevent the emergence of MSDs. Support from the company, training, and collaboration with therapists are needed. Self-management is a holistic approach that includes bio, psycho, social, and spiritual elements; this strategy is a long process that requires the active

empowerment of the employees concerned—who, in the end, will be equipped with the knowledge and skills to achieve these targets (Richardson et al., 2018).

A stretching program is the most effective strategy to prevent and rehabilitate musculoskeletal complaints, such as neck, shoulders, and lower back pain. Stretching exercises in the workplace have several benefits, including reducing muscle tension, increasing muscle tissue flexibility, reducing the risk of muscle injury (cramps), reducing the risk of back pain/injury, and optimizing daily activities (Van Eerd et al., 2016).

Research by Jatmika et al. (2022) revealed that there was a significant relationship with complaints of MSDs among laborers at Yos Sudarso Port, Tual City, Maluku Province, namely age ( $p = 0.000$ ), length of service ( $p = 0.000$ ), workload ( $p = 0.046$ ), and work posture ( $p = 0.008$ ). In this study, it was found that the age factor of having a work period longer than five years with a heavy workload, as well as awkward work postures, increased the risk of the occurrence of MSDs. Workplaces must pay attention to the maximum age limit for workers, and workers must use rest time as efficiently as possible when not working, such as by diligently stretching or exercising. The workplace must provide a safety briefing to workers before starting work regarding techniques for lifting goods, and workers should avoid lifting goods beyond their proper capacity.

Biomechanical, psychosocial, and individual characteristics are risk factors for MSDs. If such conditions develop unfavorably, they can cause chronic neck and back pain and lead to osteoarthritis and rheumatoid arthritis. MSDs, if not handled properly, will disrupt the health of these employees, such as decreasing their concentration power and causing fatigue, which can result in a loss of time at work (not present at work or unable to work). In the end, productivity decreases, which is likely to have an impact on the company in terms of profit (Pourahmadi et al., 2019).

It has been proven that a stretching program carried out before work can be beneficial in reducing MSDs, namely, by reducing complaints of intermittent joint pain, fatigue, and pain in the neck, back, and waist areas. Such exercises should be brief, no more than 10 minutes, but the results are excellent and long-term, resulting in the increased prevention of MSDs (Angelova, 2019). Evidence-based practice shows that the surest course of injury prevention is health promotion and stretching in the workplace. This can increase the level of satisfaction for workers and worker productivity and reduce the cost of care/medication for companies and employees (Sundstrup et al., 2020).

According to a report on a company X, its workers have various conditions, such as long sitting, long standing, awkward postures, work layout, and so on, that are risk factors for MSDs. While in the exposure area, workers are at risk of experiencing further physical problems. Based on secondary data taken from the clinic visit report in 2021, the preliminary study conducted by the researchers identified that of the 530 employees who underwent treatment at the company clinic, 251 were diagnosed with MSDs. Given such a high incidence of employees experiencing MSDs, they need to be equipped with the knowledge and skills to use self-management strategies in daily work activities to improve their health, which will have the effect of increasing work productivity.

## Methods

This research adopted a quantitative approach by taking action or treatment (quasi-experimental) with a pre-test–post-test control group design. The MSD risk measurement instrument used the Nordic Musculoskeletal Questionnaire (see Table 1 and Table 2). The population in this study was all employees of a company X, and the sample size used was calculated using a rule-of-thumb formula, resulting in a total sample of 90. The study used probability sampling, with simple random sampling applied to two groups. The total intervention group consisted

of 22 participants, with a control group of 68 participants.

The inclusion criteria for this research were workers with an age range of 17 to 55 years, whose length of service at the factory ranged

from less than 1 year to 25 years. The job description for factory line/production included the following activities: lifting, carrying, pushing, and pulling up to 50 pounds per task during an 8-hour shift. The intervention group was given Self-Management: A New Eight-Minute

Table 1. Nordic Scale

Skeletal Muscle	Scoring				Nordic Body Map (NBM)
	1	2	3	4	
Neck					
Nape					
Left shoulder					
Right shoulder					
Left upper arm					
Back					
Right upper arm					
Wasit					
Hips					
Butt					
Left elbow					
Right elbow					
Left forearms					
Right forearm					
Left wrist					
Right wrist					
Left hand					
Right hand					
Left thigh					
Right thigh					
Left knee					
Right knee					
Left calf					
Right calf					
Left ankle					
Right ankle					
Left foot					
Right foot					

No complaints at all (Score 1); slight complaints of pain (slightly painful) (Score 2); there are complaints of pain (pain) (Score 3); complaints of very painful (very painful) (Score 4).

Table 2. The Nordic Scale Interpretation

Likert Scale	Score Total	Risk Level	Corrective action
1	28 – 49	Low	No corrective action is required yet
2	50 – 70	Middle	Action may be needed at a later date
3	71 – 90	High	Immediate action is required
4	92 – 112	Severe	Comprehensive corrective action is required as soon as possible

Stretching Program (Self-Management Program) as preventive intervention. The program included upper and lower limb exercises. Each employee could pick one or more types according to their needs (see Table 7).

Exclusion criteria were workers who were sick or on leave from work. The research location was a company X. Statistical analysis was conducted using Wilcoxon and Mann–Whitney tests. This study was approved by the Health Research Ethics Committee, Faculty of Medicine and Health, University of Muhammadiyah Jakarta (reference number 040/PE/KE/FKK-UMJ/I/2022).

## Results

Table 3 presents the characteristics of the respondents based on gender, of which there were more male respondents than female, namely 50 (55.7%). These data show that male workers or employees are likelier to develop MSDs. This is because men are given responsibility in the family hierarchy and must work. As economic drivers in the family system, men are obliged to work to provide for themselves and other family members.

Additionally, the majority of respondents, namely as many as 41 (45.5%), were in the age range of 21–30 years. This data shows that the largest

number of workers are adults. At an adult age, an individual's knowledge and skills have been provided through an advanced education process, so in adulthood, the purpose of life to be continuing one's self-existence and developing career paths in the private sector, government, labor, and business.

Another important factor is the length of work. Of the total 90 respondents, who were divided into the intervention group and the control group, it was found that the greatest value was in the category of having worked more than one year, namely 72.2%.

This illustrates that the majority of company employees have worked for more than one year, which demonstrates that these employees have high loyalty and feel comfortable working at the company. There are several reasons why a worker is comfortable working in one company without having to frequently change their place of work. These include salary (financial), facilities received, work atmosphere or environment, good and wise leadership, a clear career path, time flexibility, learning opportunities, company culture, and challenges.

**Identifying MSDs in the Intervention Pre-test and Post-test Groups for Self-Management Program at a Company X.** Table 4 shows that the pre-test group of a company X

Table 3. Respondents' Characteristics

Characteristics	Control group		Experiment group		Total	
	Amount	%	Amount	%	Amount	%
Gender						
Male	14	63.6	36	52.9	50	55.7
Female	8	36.4	32	47.1	40	44.3
Total	22	100	68	100	90	100
Age						
17–20 years old	11	50.0	30	44.1	32	35.7
21–30 years old	9	40.9	23	33.8	41	45.5
31–50 years old	2	9.1	15	22.1	17	18.8
> 50 years old	0	0.0	0	0.0	1	0.0
Total	22	100	68	100	90	100
Length of work						
≤ 1 Year	4	18.2	21	30.9	25	27.8
> 1 Year	18	81.8	47	69.1	65	72.2
Total	22	100	68	100	90	100

Table 4. Pre-Post Treatment MSDs Level Characteristics of Employee Respondents at a Company X

MSDs Level	Control group		Experiment group		Total	
	Amount	%	Amount	%	Amount	%
Pre-test						
Low (28–49)	0	0	1	1.5	1	1.1
Middle (50–70)	1	4.5	4	5.8	5	5.5
High (7–90)	12	54.6	42	61.8	54	60.1
Severe (91–112)	9	40.9	21	30.9	30	33.3
Total	22	100	68	100	90	100
Post-test						
Low (28–49)	4	0	41	44.1	44	46.4
Middle (50–70)	2	4.5	17	26.6	15	6.7
High (71–90)	12	54.6	6	13.1	18	13.1
Severe (91–112)	9	40.9	5	16.2	14	11.2
Total	22	100	68	100	90	100

Table 5. Mann–Whitney Test Differences in MSD Complaints Among Employees in the Intervention and Control Groups

	Mean Rank	N	Mann–Whitney U	Z	Sig. (2-tailed)
Pre-test			1256.500	-0.147	0.883
Control group	59.67	22			
Experiment group	58.78	68			
Post-test			28.000	-8.571	0.000
Control group	102.03	22			
Experiment group	44.82	68			

Table 6. Wilcoxon Differential Test of Self-Management: A New Eight-Minute Stretching Program against MSDs at a Company X

	Mean	N	SD	Z	Sig. (2-tailed)
Pre-test	3.5795	68	0.63827		
Post-test	1.3182	68	0.46844	-8.221	0.000

employees had complaints of MSDs in the high category (60.1%). Complaints were felt in the neck, back, and lower back. It also shows that the post-test group of a company X employees had complaints of MSDs in the low category (46.6%). Complaints were felt in the areas of the neck, back, and lower back and were reduced after performing Self-Management Program.

#### Identifying the effect of Self-Management Program on Musculoskeletal Disorders in the Intervention and Control Groups at a

**Company X.** The results of the Mann–Whitney differential test showed that there was a change in the level of MSD complaints when Self-Management Program was carried out in the intervention and control groups.

The results of the different tests in Table 5 show that, at the pre-test, the intervention and control groups had high levels of MSD complaints and showed no significant difference, with a p-value of 0.883. However, after the intervention, a significant difference was found between the control and intervention groups, with a p-value

of 0.000. It can be concluded that during the pre-test, complaints of MSDs were at a high level; however, during the post-test or after being carried out and given Self-Management Program, both the intervention and control groups of employees experienced a significant decrease in the level of MSD complaints.

**Identifying the Effectiveness of Self-Management Program on MSDs in the Control Group at a Company X.** The results of the different tests in Table 6 show that during the pre-test and post-test, there was a significant difference between the control and intervention groups with a p-value of 0.000. It can be concluded that during the pre-test and post-test of MSD complaints, significant results were achieved by employees doing Self-Management Program.

## Discussion

In general, factory employees will experience health problems or complaints around areas of the body, specifically the arms, neck, shoulders, back, and legs. These are caused by the procedures, positions, and length of work. The type of work carried out often uses the shoulders, waist, back, and leg areas continuously, without any prior stretching or relaxation, for more than five hours of effort (Tavakkol et al., 2020).

Often, areas of the body that manifest MSDs will experience complaints approximately 12 months after the worker has carried out their work. In the results of this study, more employees experienced MSD complaints after more than two years of work. This time factor significantly contributes to the risk of MSDs (Mariawati et al., 2021). MSD complaints mainly include aches, pains, and cramps. Pain is the body's alarm system, which requires a change in position and rest to restore the body's full posture or anatomy. The recommended intervention is to focus on the ergonomic system, namely, how the body's posture when working must be appropriate and avoid awkward postures. Another intervention is to be educated on

the importance of bodily health and independent exercise or stretching (Labao et al., 2018).

Although these MSD complaints are in the severe category range, following Self-Management Program can result in a significant reduction. Performing the program's rhythmical movements stretches the joint areas of the bones, providing flexibility and relaxing these areas and reducing the shoulder, hip, and back pain that is typical of MSDs. Stretching that is done independently will be more effective and efficient, does not require an instructor, does not require space, and is flexible with time when working, so long as practitioners make the necessary commitment to self-management. If we want to be healthy and productive, then we must take care of our bodies while working. This can be accomplished by following the Self-Management Program during working time. This research can be further developed by looking at several factors, including the length of time that the Self-Management Program is used, identifying any comorbidities, and emphasizing the need for commitment by the company.

This stretching can be done at any time outside of rest hours, following actions or movements that can be chosen from the provided guide images and according to the areas of the body that will be stretched (see Table 7). This stretching is easy and does not interfere with working hours.

## Conclusion

Self-Management: A New Eight-Minute Stretching Program (Self-Management Program) delivers quite significant results in the reduction of pain caused by MSDs. Stretching carried out by employees can reduce complaints in the muscles and joints in areas of the body. This exercise is a systematic and structured movement, using a guide in the form of clear images so that it will provide flexibility and relaxation in the affected areas. Furthermore, this intervention can be carried out in all types of work. Stretching that is done independently will be more effective and efficient, so it does not re-

quire an instructor, does not require space, and is flexible with time when working, provided that its practitioners make a commitment to self-management. If we want to be healthy and

productive, then we have to take care of our bodies while working. While not engaged in working, follow the directions of Self-Management Program.

Table 7. Guide Intervention of Stretching













Name of exercise	Description	Picture
Eyes	Sit up straight, face forward and repeat this sequence several times without moving the head. Look up, then down. Look left, then right.	
Neck Stretches Retraction	Pull head back as far possible and down slightly. Hold posture for 10–15 seconds. Return your head to the centre Repeat 2 or 3 times.	
Rotate Head from Side to Side	Slowly turn your head left as far as you can. Hold posture for 10–15 seconds. Return your head to the centre. Turn your head in the opposite direction and hold for 10–15 seconds. Repeat 2 or 3 times.	
Tilt head From Front to Back	Tilt your head slowly back, far enough so you can look up. Hold posture for 10-15 seconds. Return slowly to a normal position, then tilt forward to stretch the back of your neck and hold for 10–15 seconds. Repeat 2 or 3 times.	
Tilt head From Side to Side	Keep your face looking forward as you slowly tilt your head over to your shoulder. Don't go so far that you touch your ear with your shoulder. Hold posture for 10–15 seconds. Return your head to centre position. Move your head to your opposite shoulder and hold for 10–15 seconds. Repeat 2 or 3 times.	
Neck Protraction	Push head forward as far possible and. Hold posture for 10–15 seconds. Return your head to the centre Repeat 2 or 3 times.	
Chin Tuck	Raise the head to straighten the neck. Tuck the chin in and downwards, creating a double chin. Hold for 10 seconds and repeat several times.	
Cross-Chest Stretch	Pull your left arm across your chest and push on your elbow close to your chest with your right hand. Hold for 10–15 seconds. Repeat 2 or 3 times.	
Triceps Stretch	Raise right arm over your head with elbow pointing towards the ceiling. Pull down to elbow with opposite arm and lean arm towards the opposite side. Hold for 10–15 seconds. Repeat 2 or 3 times.	
Biceps Stretch	Reach arms behind your back and interlock fingers Slightly raise arms and pull them away from your trunk. Hold for 10–15 seconds. Repeat 2 or 3 times.	
Reach for the Sky	Raise hands over head, stretching as high as possible. Then bring arms back down. Hold for 10–15 seconds. Repeat 2 or 3 times.	
Protracting and Retracting the Shoulders	While standing, slowly take your shoulders forward as far as possible, as if you were trying to make them touch one another in front of your chest hold for 10–15 seconds. Then take them back as far as possible, squeezing the shoulder blades together and hold for 10–15 seconds. Repeat 2 or 3 times.	



Table 7. Guide Intervention of Stretching

















Name of exercise	Description	Picture
Shoulder Shrugs	Slowly lift your shoulders up as if you were attempting to touch them to your ears. Lift as high as you can and hold for 10–15 seconds. Repeat 2 or 3 times	
Palm Press	Place palms together, point fingers toward ceiling. Keeping palms together, try to push heels of hands towards the floor. Hold for 10–15 seconds Repeat 2 or 3 times.	
Wrist Flexor Stretch	Keeping elbow straight, grasp the hand and slowly bend wrist back until stretch is felt. Hold for 10–15 seconds Repeat 2 or 3 times.	
Wrist Extensor Stretch	Keeping elbow straight, grasp injured hand and slowly bend wrist forward until a stretch is felt. Hold for 10–15 seconds Repeat 2 or 3 times.	
Wrist Radial/Ulnar Deviation	Grasp injured hand with the other hand and gently stretch the hand and wrist from side to side as far as possible. Hold for 10–15 seconds seconds. Repeat 2 or 3 times.	
Forearm Pronation Stretch	With an injured hand in a handshake position, grasp and slowly turn to palm up until stretch is felt hold for 10–15 seconds and Repeat 2 or 3 times.	
Finger Flexion/Extension	Actively bend the fingers of the injured hand. Start with knuckles furthest from palm, and slowly makes a fist. Hold for 10–15 seconds and Repeat 2 or 3 times.	
Pectoralis Major Stretch	Place both arms directly behind you against a flat surface with arms parallel to the floor. Push against a flat surface until stretch is felt in chest Hold for 10–15 seconds. Repeat 2–3 times.	
Lying Abdominal Stretch	Lie on front side and push upper torso upwards with arms until stretch is felt. Hold for 10–15 seconds Repeat 2–3 times.	
Side Stretching	From a neutral standing position slowly bend to the left or right Hold for 10–15 seconds Repeat 2–3 times.	
Oblique Muscle Stretch	From a standing neutral position, cross your arms across your chest. Keep your back straight and slowly rotate your shoulders to each side. Repeat 10–15 times.	
Cat and Camel	On all fours, assume a “hump” back position by arching the backup. Hold briefly and then slowly lower the back into a sagging position Repeat 10–15 times.	
Lumbar Rotation	Slowly rock knees from side to side in a pain free range of motion. Allow back to rotate slightly. Repeat 10–15 times.	
Tail Wag	On all fours with back maintained in a neutral position, gently move hips toward the rib cage to side bend trunk. Hold briefly, then alternate and do the other side. Repeat 10–15 times.	
Latissimus Dorsi Stretch	Begin by kneeling and extending forward until a stretch is felt. Slide hands forward and push buttocks backward Hold for 10–15 seconds Repeat 2–3 times.	
Mid Back Stretch	With hands on the small of the back, slightly bend back until stretch is felt Hold for 10–15 seconds Repeat 2–3 times.	

Table 7. Guide Intervention of Stretching


















Name of exercise	Description	Picture
Standing Quadriceps Stretch	Pull heel toward buttocks until a stretch is felt in front of the thigh. Keep leg close to body with knee pointing to the floor. Hold for 10–15 seconds Repeat 2–3 times.	
Lying Quadriceps Stretch	Lie on your side. Pull heel toward buttocks until a stretch is felt in front of the thigh Hold for 10–15 seconds Repeat 2–3 times.	
Lying Hamstring Stretch	Slowly bring the knee towards the chest. Gently extend leg with knee slightly bent and hold when in a comfortable stretch. Hold for 10–15 seconds Repeat 2–3 times.	
Sitting Hamstring Stretch	Bend knee of left leg and keep right leg extended with the knee slightly bent. Bend at the waist towards your left foot. Hold your lower leg for support. Hold for 10–15 seconds Repeat 2–3 times.	
Standing Hamstring Stretch	Left leg in front of you. Bend right knee. Lean forward, placing hands on bent leg. Keep back straight. Hold for 10–15 seconds Repeat 2–3 times.	
Soleus (Lower calf)	Hands against the wall. Keep the back leg straight, bend knees of both legs. Push heels down and slowly lean forward until a stretch is felt in the back of the calf Hold for 10–15 seconds Repeat 2–3 times.	
Gastrocnemius (Upper calf)	Hands against the wall. Keep back leg straight Push heels down and slowly lean forward until a stretch is felt in the back of the calf Hold for 10–15 seconds Repeat 2–3 times.	
Hip Adductors Stretching	Gently push knees to floor until a stretch is felt. Keep back straight. Hold for 10–15 seconds Repeat 2–3 times.	
Hip Abductors Stretching	Cross your right leg over your left leg. Look over your right shoulder while turning your trunk and pushing back on knee with left elbow Hold for 10–15 seconds Repeat 2–3 times.	
Hip Flexors/Extensors	Slowly lean and push hip to floor until a stretch is felt in front of hip Hold for 10–15 seconds Repeat 2–3 times.	
Gluteal Muscles stretching	Place right foot above left knee. Slowly lift left leg towards the chest. Keep arms flat on floor Hold for 10–15 seconds Repeat 2–3 times.	
Anterior Tibialis Stretch	Sit in a chair and cross your right leg onto your left thigh. Your malleolus, or 'ankle bone', should be about 2 inches off your thigh. With your left hand, grasp the top of your foot and pull your foot towards your left side, making sure movement occurs at the ankle joint. A stretch should NEVER HURT! Attain a good, pain free stretch and hold for 15 seconds, then switch and stretch left leg. Repeat that 2–3 times.	
Plantar Flexion Stretches	Point the foot down against resistance of the tubing. Let up slowly Repeat 2–3 times.	
Dorsiflexion Stretches	Pull the foot towards the face against the resistance of the tubing. Lower slowly Hold for Repeat 2–3 times.	
Inversion Stretches	Turn the sole of the foot inward against resistance of the tubing. Let out slowly. Keep knee pointed up. Repeat 2–3 times.	
Eversion Stretches	Turn the sole of the foot outward against resistance of the tubing. Let in slowly. Keep knee pointed up. Repeat 2–3 times.	

Table 7. Guide Intervention of Stretching

Name of exercise	Description	Picture
Seated Calf Stretch	In a sitting position, loop a towel around the ball of your foot. Gently pull back on the towel. The knee should be straight. Hold for 10–15 seconds Repeat 2–3 times.	

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