**VDTHealth**

A program to improve comfort, safety, productivity and overall quality of life in office workers, with primary and secondary prevention strategies on Work Related Musculoskeletal Disorders, caused by use of Video Display Terminal units in city of Charlotte, North Carolina

**Abbreviation list:**

VDTHealth Name of this Program

WRMD Work Related Musculoskeletal Disorders

VDT Video Display Terminals

OSHA Occupational Safety and Health Administration

NIOSH National Institute of Occupational Safety and Health

ADL Activities of Daily Living

BLS Bureau of Labor Statistics

CTD Cumulative Trauma Disorder

PT Physical Therapy

PP Primary Prevention

SP Secondary Prevention

QOL Quality Of Life

OSHA Occupational Safety and Health Administration

QEC Quick Exposure Check

ROM Range of Motion

VAS Visual Analog Scale

MMT Manual Muscle Testing

WPAI-GH Work Productivity and Activity Impairment –General Health

WLQ Work Limitations Questionnaire

ACSM American College of Sports Medicine

PT Physical Therapist/ Physical Therapy

PTA Physical Therapist Assistant

APTA American Physical Therapist Association

IT Information Technology

PA Physical Activity

LBP Low Back Pain

APTA American Physical Therapy Association

UE Upper Extremity

EBL Evidence Based Literature

**It is definitely helpful to provide a list of acronyms – as you continue to develop the proposal, it would be better to try to reduce this list. For acronyms that you only use a few times it would be easier to just write it out each time.**

**Hi Lavanya,**

Overall, this is a solid program addressing comfort, safety, productivity and overall quality of life in office workers. As you continue to develop the proposal the best next step would be to consider the use of acronyms as it becomes difficult to read in certain sections.

**Happy holidays,**

**Sadye**

**VDTHealth :** A program to improve comfort, safety, productivity and overall quality of life in office workers, with primary and secondary prevention on Work Related Musculoskeletal Disorders, caused by use of Video Display Terminal units in city of Charlotte, NC.

**Statement of Need:** With technological advances, computers have become ubiquitous, with their presence in major sectors of life including education, research, Information Technology (IT), communications, banking, administration, healthcare, etc.26 According to the US Census in 2003 and 2004, 55.5% (77 million people) and 75%, respectively,of the American population were found to be using computers at work.9,23 Computers have improved transactions, data storage, and work and time efficiency, without a need for clerical activities, like paper copying or filing. 9,14 However, this productivity gain is negated to a great extent by a decrease in the employee’s safety, comfort and productivity, with the development of Work Related Musculoskeletal Disorders (WRMD).3,9,14

WRMD, related to Video Display terminals (VDTs), have been associated with prolonged static postures and repetitive movements resulting in disorders of the neck, Upper Extremity (UE) and back.1, 7,8,17 The Occupational Safety and Health Administration (OSHA) and National Institute of Occupational Safety and Health (NIOSH) have been striving to overcome WRMD due to VDTs 20, 21 WRMD due to VDTs have been identified as those that are caused by direct injury at the work site (affecting ‘safety’) and those that are exacerbated by job duties (affecting ‘comfort’ of the employee).3 Many of these WRMDs are so disabling that they may affect the person’s ability to participate in his own Activities of Daily Living (ADLs) and affect his work ‘productivity’ and his overall ‘quality of life’ (QOL). 17, 20, 21

About one third of the US population is affected with WRMD /year. 18According to OSHA, employers spend about $20 billion annually for worker’s compensation and more than $50 billion for indirect costs associated with decreased productivity and decreased turnover. 20,21 In 2011, a total of 1,181,290 cases of non-fatal WRMD were reported to United States Department of Labor. 22 Of the 908,310 cases reported to the Bureau of Labor statistics (BLS) from the private sector in 2011, 12,210 were neck complaints, 182, 270 were back complaints and a total of 269,550 were UE cases, involving shoulder, arm, forearm, and wrist.24

North Carolina has 99,950 employees who work solely on computers (VDTs) with jobs ranging from software developers to IT researchers.26 Charlotte itself has about 55,500 employees working in software, mathematical, IT, and communication fields that use VDTs excessively for daily work. 25 This estimate does not include those who depend excessively on VDTs, in office and administrative work (18% of charlotte population) and those in finance sector. 25 Currently 42,050 employees in Charlotte work in the finance sector25, and 82.4% of them have to use VDT at work. 23 Also, Charlotte is one of the Nation’s fastest growing cities, with a dramatic rise in computer users, consequent to it being the headquarters of 7 of the Fortune 500 companies and being the second largest banking center in the entire United States. 25

At this time, there is a definitive need for a program, like VDTHealth, in Charlotte that would prevent WRMD (safety), decrease symptoms of WRMD (comfort) and help in improving the work ‘productivity’ and overall ‘QOL’, in this increasing employee population that use VDT.

**Background:** A contributory factor for WRMD in sedentary jobs is the continuous activation of involved motors units at low intensity thresholds for prolonged duration, without allowing for muscle recovery from metabolic overload, resulting into cellular death, necrosis, and pain. 4 Sustained postures and repetitive movements have been identified as primary risk factors for Cumulative Trauma Disorders (CTD), resulting in conditions like carpal tunnel syndrome, thoracic outlet syndrome, back pain, tendonitis, etc., in those who work on VDT.1,7,8,15,17 Bergqvist et al found that those who use VDT for > 20 hours/week are at risk for WRMD related to UE, compared to those who do not use VDT, with risk factors identified as, use of corrective lenses, stress reactions, absence of rest breaks, presence of repetitive movements and lack of proper posture (e.g. absence of forearm support). 11 Psychosocial workplace risk factors identified are poor work organization, lack of mental rest, increased anxiety/ workload/ time pressure and decreased social support. 15,17 Employees’ perception of comfort, exertion, work load , and factors like job dissatisfaction, have been found to play a great role in WRMD development.1,4,7

This stresses that workplace interventions should target the following parameters - physical/ergonomic, psychosocial, work organization, and should involve both the employees and the Management. 1,2 A workplace intervention should aim towards improving health (comfort and safety), productivity and overall QOL of the workers.2,3 In VDTHealth, the term ‘office workers’ refers to those who spend the majority of their work time (>80%) with VDT for job duties. 3 Ergonomics refers to the relation between the worker, his work style/pattern, his job duties and his interaction with the workplace environment.2 Lastly, the term ‘safety’ refers to the prevention of risk factors (primary prevention (PP)), ‘comfort’ refers to a decrease in the severity of existing symptoms (secondary prevention (SP)), and ‘productivity’ refers to how efficiently the job duties are accomplished. 2,3

Various interventions have been found to improve safety, comfort, productivity, and QOL in VDT users. Physical activity (PA) has been found to be beneficial, in both PP and SP of VDT related WRMD.4,7, 8,16 PA of as less as 5 min, in form of light resistance training significantly decreases symptoms associated with WRMD in office workers. 4 At 12-month follow up of a study with PA as intervention, an improvement was noted in physical well being, self confidence and mood in the office workers. 4 PA, in form of Tai Chi, has also been found to increase musculoskeletal fitness and psychological well being, when used in office workers. 16

Ergonomic counseling with workplace intervention (change of workplace equipment) has widely been used and associated with improvement in comfort and productivity in WRMD due to VDT. 1-3,6,10,13,21 However, a review by Driessen et al12, pointed out that physical ergonomic intervention (e.g. adding new workplace equipment) and organizational ergonomic intervention (e.g. making system level changes like change in job rotations) were not effective in decreasing prevalence and incidence of low back pain (LBP) and neck pain or in decreasing the intensity of LBP.12  Alternatively, mixed reviews are present about the effectiveness of ergonomic education and counseling in improving ‘comfort’ (PP), in those having WRMD from VDT use. 3,12

‘Rest breaks’, another intervention with mixed evidence, helps to break the continuity in static loading and in repetitive movements and thereby prevents CTD by providing time for muscle recovery. 1,37-9,15,17 CTD is one of the primary risk factor for WRMD related to VDT. 1,3,7-9,15,17 McLean et al. found that micro rest breaks of about ½ a minute every 20 minutes for back, UE and every 40 minutes for neck pain facilitated significant decrease in WRMD symptoms by improving both ‘comfort’ and ‘safety’, without depreciating ‘productivity’. 14 This latter finding is critical to motivate organization’s Management to implement rest breaks, without being apprehensive about possible decline in productivity. 3,14

Based on the Occupational Health guidelines of the Orthopedic Section of the American Physical Therapy Association (APTA), VDTHealth intends to overcome WRMD, by striking a balance between worker demand, capacity and behavior.2 Instead of just traditional physical therapy (PT), a combination of PT with ergonomic interventions is most beneficial in gaining significant improvements in VDT-related WRMD.8. Thus VDTHealth will include PA addressing aerobics, strengthening and flexibility, along with ergonomic education for PP and SP of VDT-related WRMD.1-4,6-8,10,13,16,21 No new workstation equipment, however, will be provided to employees, based on the study by Driessen et al12. Alternatively, education about changes to the existing workplace will be included, based on study by Voerman GE et al. 13 Despite the mixed evidence, rest breaks are going to be included in VDTHealth, due to the author’s belief that rest breaks would greatly assist in overcoming CTD1,7,8,15,17.

Further, apart from job related physical stresses, there is mounting evidence that psychological stresses from lack of social support from superiors, high workloads, job dissatisfaction, etc, play a critical role in development (PP) and worsening (SP) of VDT related WRMD, affecting worker’s productivity and overall QOL.1,2,7,15,16,33,37 To counteract workplace psychosocial stresses and for the success of an ergonomic intervention, according to Robertson MM et al10, involvement of management is important for improving awareness of the existing workplace associated stresses and of the need to change the work style habits in the organization (e.g. introduction of rest breaks), for PP and SP of VDT related WRMD.2,4,10 Thus VDTHealth will be implemented in only those organizations where the employers are willing to improve the physical and psychological health of their employees, along with incorporation of stress management education sessions in VDTHealth for the office workers.

Lastly, this program is an attempt to address the limited literature present related to combined application of PP and SP, 3,12  the limited number of studies4,5 that have addressed comfort, safety and productivity1 together with SP3 and the limited literature that the author was able to find about treatment of low back pain, associated with VDT related WRMD**.**

**Adding a theory to the background would further support the proposal**

**Objective**s: For this 3 month program, named VDTHealth, primary outcomes are PP and SP of WRMD in office workers, to improve their ‘Safety’ and ‘Comfort’, respectively, and thereby to improve their ‘Productivity’ and their overall ‘QOL’. 2,3,17,20,21 Thus, ‘Productivity’ and ‘QOL’ are the secondary outcomes for VDTHealth. Further, this program is planned to be conducted in Charlotte, one of the fastest growing cities in United States, that is booming with office workers, working in computer, finance and IT sectors.23,25

**Primary Outcomes: (A).** **Safety:** **(a)** PP in office workers is aimed at empowering them with ability to overcome risk factors for WRMD (‘safety’),with awareness about healthy work ergonomics and regular PA. 1-4,6,8,10,13,21 **(b)** Assessment of the outcomes with PP will be done by OSHA VDT check list17,28 and Quick Exposure Check28,36 (QEC) assessment. **(c)** OSHA VDT checklist and QEC will be assessed monthly for all participants. 17,36

**(b).** **Comfort:** **(a)** SP is aimed at decreasing or eliminating WRMD symptoms and signs in office workers (‘comfort’), with ergonomic education and PA. 1-4,6,8,10,13,21 **(b)** In VDTHealth, the key difference between SP and PP interventions will be the development of ‘individualized’ PA and ergonomic modification sessions for the SP intervention. **(c)** Based on established guidelines, assessment will be done with Manual Muscle Testing (MMT) for major muscle groups, Range of Motion (ROM) assessment for joints, and Visual Analog Scale of Pain (VAS) of UE, back and neck. 30,32 **(d)** For VDTHealth, ROM and MMT assessments will be done monthly, while VAS assessment will be done weekly.

**Secondary Outcomes: (A).** **Productivity:** **(a)** Productivity in VDTHealth is concerned with two main aspects –‘Absenteeism’ (the days ‘off’ work, taken due to WRMD) and ‘Presenteeism’ (employee is at work, but presents decreased work performance, secondary to WRMD). 31,34,37

 **(b)** To measure both, Work Performance and Activity Impairment –General Health (WPAI- GH) and Word Limitation Questionnaire (WLQ) will be administered.31,33,34,37 **(c)** Based on their recall, WPAI –GHshould be administered weekly, while WLQmonthly. 31,33,34

**(B). QOL:** **(a)** Another secondary outcome that will be measured under VDTHealth is ‘QOL’. SF-36 assessment will be done to assess the impact of the VDTHealth intervention on both the physical and mental component of the employee’s life.29 **(b)** It will be measured at the beginning and at the end of 3 month VDTHealth program.

Overall these are good however, it is difficult to follow with all the acronyms. The list does help but do consider only using a select few

Though Minimal Clinically Important Differences (MCID) are not established for some of the assesssents32, by the end of 3 months of VDTHealth, the following objectives should be achieved for VDTHealth to be considered a success, in providing PP and SP to the office workers of the selected organization. By the end of the 3 months of VDTHealth -

1. 90% of the individuals will present in ‘Low’ exposure range, both for physical and mental stresses on QEC36 **(2)** Based on OSHA VDT checklist, at least 90% of the workstation environment for all employees will be arranged according to the VDT checklist recommendations.17 **(3)** 90% of the patients will present improvement in MMT to 4+/5 grade for major muscle groups and normal ROM for joints of UE, back and neck. 30 **(4)** For 90% of the patients, VAS pain scores will demonstrate at least a decrease by 30 mm for meaningful change at UE, back and neck. 32 **(5)** 90% of the patients will demonstrate an improvement in WLQ by at least 13/10037 and will demonstrate a decrease in work impairment score in WPAI-GH by at least 15%, by the end of 3 months.

Feasible and measureable - good

**Method:** Criteria for recruitment: For VDTHealth, Advertisement and promotion program will be done at all organizations in Charlotte that have office workers constituting >70% of their total employees. Local hospitals will also be contacted for gaining Physical Therapist (PT) staff. For interested organizations, therapists will themselves personally respond and promote VDTHealth. Of the interested organizations, two will be selected for the implementation of the VDTHealth.

The criteria for the selection of the organization will be – **(1)** Management will allow employees to get involved in fitness exercises/ergonomic education class for ½ hour of their work time, each day for 3 months; and **(2)** Management will allow employees to take micro-breaks during work hours. Further, the criteria for selection of the employees will be as follows: Employees will- **(1)** Provide informed consent to participate in VDTHealth program; and **(2)** Be agreeable to follow the exercise prescription provided over the course of 3 months. Participants, who leave the company, are hired new, develop WRMD, take sick leave for more than 3 days at a time, or participate in workers’ compensation during VDTHealth, will be dropped.

**Site Parameters:** The site should include a large room in the organization with access to foldable tables, foldable chairs, mats, free/ cuff weights and therabands. The room will be arranged with foldable tables and chairs for education class, mats for flexibility session and free/ cuff weights and therabands for strengthening session. If such a room is not available in the organization, closest fitness center will be contacted for access to such a room or a room will be rented close to the location of the Organization. PTs and PT assistants (PTAs) will conduct, educate, monitor and assist performance of the participants, during the class.

**Intervention:** At baseline, based on a screening form (developed by therapists) for signs and symptoms of WRMD, participants will be divided into PP and SP groups and each group will be further subdivided into two subgroups to have manageable class size. PP subgroups will be allotted to a team of one PT and one PTA, while SP subgroups to a team of two PTs and one PTA, with each team being responsible for its own subgroup for VDTHealth program.

Informed consent will be signed by all participants. Following this, baseline assessment will be performed, with all participants receiving QEC, OSHA VDT, WPAI-GH, WLS, SF-36. In addition, those of the SP subgroups will receive individualized ROM, MMT, VAS, QEC, OSHA VDT assessments, from the respective PTs of that subgroup. WPAI-GH31,34 and VAS32 will be assessed weekly following ergonomic education session, while all other measures will be assessed monthly and at the end of the program. During the monthly or weekly assessments, if at any time red/yellow flags are found, assessing PT will refer participant to a physician.

**Intervention 1**: PA: According to American College of Sports Medicine (ACSM) guidelines, all participants will have ½ hour strength training session 2x/wk and ½ hr of flexibility training 2x/wk, addressing all major muscle groups.27 Those, who are in SP subgroups will have these sessions to work on individualized strengthening and flexibility programs, to address muscle groups pertaining to their current WRMD symptoms. PTs and PTAs will be available during this session to overcome any barriers to participation. Free Gym Membership will be provided to all participants for 3 months at the local gym and participants will be educated and encouraged to get involved in at least 150 minutes moderate aerobic activity/ wk27, during after-work hours. Participation in strengthening, flexibility, and aerobic exercises have been noted to improve overall health status27 and to decrease symptoms of WRMD, with improvement in musculoskeletal fitness and psychological wellbeing.2,4,8,16

**Intervention 2** : Ergonomics: Because of inability of new ergonomic equipment to produce significant improvements in WRMD12, no new ergonomic workplace equipment will be introduced at workplaces by VDTHealth. However, education will be provided to make modifications in the existing work area equipment – keyboard, chair, monitor/s, mouse, pointer, calculator, and telephone. 13,17 In addition, education on improvement on work postures will be provided to improve awareness about biomechanically appropriate alignments/movements for head, back, neck, shoulder, forearm, and wrist, during VDT use. 1-3,10,13,17,21 Stress will be placed on need for micro-breaks for every 20 minutes, to avoid CTD.1,7,8,15,17 Stress management strategies will be provided during education sessions, as stress has been strongly associated with being a high risk factor for WRMD. 1,7,8,11,17

**Intervention 3**: Interactive Website: Before the initiation of implementation of VDTHealth, an interactive website will be created. Following baseline screening, participants will be provided with education on how to navigate through this website, along with details on how to register and create their own account. Website will include access to all resources and tools that will be needed during the 3 month program, developed based on OSHA, and other evidence based literature. Participants will get access to the resources of the respective week as the program progresses.35 Participants will be able to track and log their PA in this software, which will be accessible both on mobile/tablets and laptop/computer platform, leading to increased patient involvement, self-monitoring and adherence. 35 If participants forget to log their activity information, the software will send reminders to their registered email ID the next day. Each participant’s information will be held confidential and will be collected and used only for Evidence Based Literature (EBL). There will be an interactive ‘Question and Answer’ (Q & A) support option35 in the website, where the therapists will answer the questions of the participants of their respective subgroups.

All 3 interventions – each component is good on their own as well – you could also consider starting with just the first two components are targeted towards improving ‘safety’ in all participants and ‘comfort’, especially, in the secondary group, to improve work ‘productivity’ and overall ‘QOL’, of all the participating office workers.17,20,21

**Evaluation:** Assessment: **(a) Safety** will be assessed by OSHA VDT checklist and QEC. OSHA VDT checklist is mainly designed to assess the ergonomic safety of VDT workstation. 17,28 Alternatively, QEC is designed to predict the risk for WRMD, by assessing worker postural/movement tendencies at job, for selected tasks of UE, back and neck, from both the examiner and the employee’s viewpoint. 28,36  QEC also includes employee’s perception of his work environment, job stress and job efficiency.28,36 **(b) Comfort** will be assessed by MMT, ROM, VAS to measure the severity of the existing WRMD symptoms at neck, back and UE, based on APTA’s guidelines.30,32 These tests present with overall good psychometrics.40,41 **(c) Productivity** will be measured with WPAI-GH and WLQ that have overall good psychometrics properties.33,38 WPAI-GH is a generic questionnaire that measures work productivity and will be interviewer administered in VDTHealth31,34 While, WLQ is a self-report questionnaire that assess employee’s inability to handle physical, mental-interpersonal, and time/ output demands of his job due to his physical/psychological problems.31,33,37 **(d)** Lastly, **QOL** will be measured by SF36, that has excellent psychometric properties.29 All tests will be administered by PTs, at previously mentioned time frames. Established MCID for some of these tests are as follows – 3 to 5 points for SF3639, 13/100 for WLQ37, minus 30 mm for VAS40.

 **Limitations**: These might be interest and motivation of the employers/ employees, unmeasured non-work related stress, probability of employees having own exercise routine, need for more number of skilled therapists, need and related cost for license procurement for WLQ and SF36.

**Relevance:** All data collected and procured through VDTHealth will be documented, providing anonymity to participants, for EBL and to support such ergonomic programs, in future.

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