

https://dspace.org/

An education based ergonomic intervention programme for Gauteng call centre workers with upper extremity repetitive strain injuries

Eliot, Sancha

2010-10-20
http://hdl.handle.net/10539/8837

Downloaded from a DSpace repository. https://dspace.org/

CHAPTER 3

METHODOLOGY

The study was divided into three phases

PHASE 1

Screening Phase

This phase included the following

- screening of computer workers for RSI
- the establishment of the prevalence of RSI in this population
- selection of participants with RSI (from this population)

PHASE 2

Programme development and pilot

This phase included the following

- The development and piloting of a booklet with an interactive education based ergonomic programme to treat and prevent the development of upper extremity RSI in call centre workers for experimental group participants.
    - Pilot Study 1 - Content validity of booklet with experts
    - Pilot Study 2 – Content validity of programme with participants
- Choice of a computer based “Break Software” to be used with the booklet

PHASE 3

Intervention Phase

This phase included the following

- allocation of participants to an experimental or control group
- Implementation of the interactive education based ergonomic programme with the experimental group
- Measuring the effect of the interactive education based ergonomic programme using clinical assessments (range of motion, (ROM), and strength of the wrist as well as pinch and grip strength) and pain (static and dynamic).
- Measuring the change in attitude to lifestyle factors on a questionnaire

3.1 PHASE 1

3.1.1. Screening Phase

This phase included the following:

- screening of computer workers for RSI
- the establishment of the prevalence of RSI in this population
- selection of participants from this population

3.1.2 Research Design

A cross sectional survey was used to identify computer workers with RSI at Gauteng medical aid company call centres. Medical aid companies were contacted and meetings were requested with representatives. The aim of this survey was the assessment of the point (one month) prevalence of upper extremity RSI and the evaluation of any existing relationship between RSI and gender, age, dominance, duration of current employment and hours worked for a defined population.

Prevalence is most commonly assessed at one point in time making a cross sectional survey where participants are assessed once (at one point in time) a suitable method (Mann, 2003). In this case questions on symptoms of RSI covered a period of one month.

3.1.3 Participant selection

3.1.3.1 Call centres

Medical aid companies were contacted and one large company agreed to take part in the research. There were a number of call centres within the company based in South Africa

To control for interaction of factors, it was originally decided that call centres themselves would be randomised rather than the actual computer users. The said medical aid company has offices in Gauteng, Cape Town, Pretoria and Durban. Eventually after discussion it was clear that randomisation could not be used and two call centres from different provinces or different office buildings within one province, were therefore to be selected for the study. It was hoped that this technique would

WiSE-TD

prevent cross pollution of education and techniques taught to the experimental group to the control group in Phase 3.

It was assumed that the differences between the call centres would be statistically insignificant due to the uniformity in terms of ergonomic layout of work stations, work place ethos in respect of hours, rate, deliverable expectancy, break periods allowed and entry level education of all employees. The layout of these areas and the amenities available were the same for each call centre. The fact that the physical layout of each call centre's break/pause area was exactly the same in physical layout, furniture available, food and drink offered and recreational games provided ensured the homogeneity of these physical environments was the same. This excluded the possibility that a leisure activity performed at work could be an added extraneous variable in the development of RSI that would be difficult to account for, or exclude, when the experimental and control groups were compared in Phase 3.

A single Gauteng based office (comprising several call centres) was finally chosen due to the logistical ease in assessing the participants although all call centres were located in the same building, but on different floors. Computer workers in the call centres were never in professional contact with any member of any of the other call centres except to email claims and queries. This was done as an automatic part of the claims process and did not involve any personal contact between the individual call centre workers.

Two of the call centres worked different shift times to the remaining five call centres. There was an overlap in times between the two extended hours call centres and the remaining five call centres, of one hour.

Each call centre was located in a different part of the main building. They had separate tea/break/lunch areas. The relaxation areas too, were in different physical locations for each call centre. Thus the co-incidental meeting of any workers was minimal. The workers were also on very strict time tables as to their "free time" use. Tea, lunch and toilet breaks were pre-assigned to each worker. These were monitored by the supervisors and by the computer monitoring programme. Thus very little time existed for moving between call centres on a social activity. This further minimised the pollution of information between the call centres selected and the possibility of pollution of information between the control and experimental groups

WISETD

selected in Phase 3. Similar designs were used by Amick III et al, 2003 and Bohr, 2000 in their studies.

3.1.3.2 Call centre workers

All workers in the seven call centres constituted the population to be screened. To determine the sample size and size of the research group, an independent statistician was consulted. A sample of 325 participants was projected to estimate the expected prevalence of 30% to within an accuracy of 5% with 95% confidence. These figures were based on those quoted in the international literature available on RSI.

To select workers eligible to participate in the study, the following criteria were used:

Inclusion Criteria

- Frequent computer use of a minimum of three hours per day, three days per week
- Frequent or chronic upper limb pain or discomfort within a period of the past one month and/or preceding two weeks
- Continuous employment by the company for duration of the study
- Not under treatment by a doctor or therapist for any upper extremity disorder
- No previously diagnosed avocational or systemic diseases e.g. rheumatoid arthritis, systemic lupus erythematosus (SLE)
- Not pregnant at time of commencement of the research project

Exclusion criteria

- Those who did not complete or submit the questionnaire
- Indication on the questionnaire of unwillingness to participate
- Under treatment for a pre-existing musculoskeletal condition
- Not in the permanent employ of the company i.e. temporary staff, staff going on leave or maternity leave
- Pregnancy

3.1.4 Measurement tool

An appropriate questionnaire to be used in the assessment of point prevalence of upper extremity RSI was selected. As this study was aiming at establishing the

WISETD

prevalence of RSI in a defined population – call centre workers- it was deemed necessary to find a questionnaire developed for that target audience. The internet was used to source questionnaires developed for assessing upper extremity RSI in computer users, specifically for call centre workers. Only questionnaires that had been researched and standardised were considered for this study. Several standardised RSI questionnaires were evaluated in terms of their efficacy to meet the research objectives.

The questionnaires considered were evaluated on their inclusion of and degree of detail of the following criteria:

- detailed demographic background
- employment history (in call centre work)
- work hours (including shift information)
- duties (time spent on computer work) length and frequency of breaks taken and allowed
- work place design
- work/life balance,
- social/managerial support and
- health (details of illnesses, time off work, time worked when ill, effect of illness on work/personal life balance and participation)

Questionnaires identified were further evaluated for ease of completion by the participants (i.e. need for clarification or explanation), length of the questionnaire, the target audience and the use of the questionnaire in previously published studies.

Several questionnaires were identified as being appropriate. The research correspondent of each project team was contacted by email and permission sought to use the questionnaire in this research project. The availability of an English version (that had been tested and used in previous research) was an important factor. The express written permission was granted for the use of the chosen questionnaire. The questionnaire chosen was the “Working conditions and health at call centres” (National Institute for Working Life (Arbetslivsinstitutet), the Department of Occupational and Environmental Medicine at Västernorrland County Council and the Institute for Psychosocial Medicine at Karolinska Institutet, 2005).

WiSETD

The questionnaire chosen was deemed the most appropriate in terms of: content measured, target group, language used and ease of implementation/completion by the research participants. This questionnaire was specifically developed for use in call centre environments and thus seemed the most appropriate on several levels. The developing team also expressed interest in the project, offered help and suggested they would be interested in the results of the study. The questionnaire used consists of sixty eight questions spaced over twenty pages. The portion of the questionnaire with questions relating to demographics was not used with this population.

Questions on the duration of employment and presence of defined symptoms in the wrist, hands and arms (pg 17-20 of the original questionnaire) were used as the screening document. (Appendix K)

These pages deal with the topic of 'HEALTH'. They cover aspects such as physical pain, the exact physical location thereof and the participants perception as to the cause of the pain, the impact of the said pain on the personal and work life of the participant and whether or not these or other injuries had been reported as work related injuries. A cover page with the inclusion criteria was included in the screening document.

3.1.5 Ethical Considerations

Written consent was obtained from the medical aid company prior to any research being conducted. Ethical clearance for the project was obtained from the Ethics Committee for research on Human Subjects at the University of Witwatersrand. (Ethics number M 070433) (Appendix F)

Each participant was provided with an information sheet explaining the study and asked to complete the questionnaire attached. (Appendix G) Informed consent was obtained and participants were assured of confidentiality as only codes and not names were used. All documentation for each participant was delivered and collected in a sealed envelope.

Participants were invited to participate and informed that non-participation would have no consequences. Withdrawal from the study also carried no consequences. It was made clear that there were no consequences from the company, related to work requirements and participation in this study. The workers were free to choose if they

WitsETD

wished to participate and were able to refuse to participate or pull out of the study at any time. No additional pressure was placed on nor was incentive to participate offered to the call centre workers by either the company or the researcher. Call centre workers willing to participate in the study, as explained to them by the team leaders and the information sheet, were asked to complete the screening questionnaire. (Appendix K)

3.1.6 Research Procedure

Written permission was granted by the medical aid company to conduct the study in the Gauteng office call centres. All call centre workers were invited to participate in the study. A discussion was held with two of the medical aid representatives, in their offices in Sandton. This meeting covered the research topic and what would be required of the medical aid staff in terms of time, participation and periods away from work.

Several issues were discussed, such as time away from the phone lines. No staff member would be allowed off the premises, thus all measurements and assessments would need to be conducted at the specific location of the various call centres located in the same office building in Sandton. Contact persons were assigned and duties shared amongst the medical aid staff and the researcher. The contact person would contact workers from various call centres. The researcher was not permitted to contact the workers personally, nor via email. The resource planning leader contacted the various call centre team leaders and briefed them on the research. They were then in turn responsible for briefing the individual workers.

The screening questionnaire, (Appendix K) together with the required information page and instructions was distributed to the call centre workers. The above documentation was placed in a sealed envelope. 325 screening packs were left with the resources planning manager and it was her responsibility to explain to the potential research participants what was requested of them.

3.1.6.1 Screening procedure

In order to obtain a point prevalence of one month the time frame mentioned in the questions was specific to the preceding month. Thus by answering these few questions, the researcher could determine whether or not the participants fitted the

WISETD

inclusion criteria for the research project. This negated the research participants having to be individually assessed or exposed to lengthy questionnaires.

A defined time period including the present and preceding month was used. This would ensure data collected would account for the inconsistent insidious nature of RSI and would be controlled for internal validity in terms of assessment. The questionnaire is used with the express permission of the National Institute for Working Life, Karolinka Institutet. (Appendix A)

On completion of the screening questionnaire and signing of the consent documentation, the participants were requested to place the documentation in the envelopes and seal them. No names or means of identifying the participants was evidenced on the outside of the envelope. This ensured that the comments made on the questionnaire were confidential and the company could not be biased toward any individual participating. The questionnaires - completed and uncompleted - were collected by team leaders and passed on to the resource planning manager. These were then collected by the researcher. Information extracted to identify phase three participants included: basic demographic data such as age, sex number of children under seven years, whether or not the inclusion criteria were met, specific sites for the pain (limited to the upper limb) and duration of pain (limited to 30 days).

3.1.7 Data Analysis

In phase one of the study; the objective was to determine the point (one month) prevalence of the RSI among call centre workers.

Data was extracted from the questionnaires and demographic data was analysed using descriptive statistics. Prevalence was established using percentages.

WitsETD

3.2 PHASE 2

Intervention Programme development

The aim of this phase was the development and piloting of an informative interactive education based ergonomic programme to treat and prevent the development of upper extremity RSI in call centre workers. The main aim of the intervention programme was to enable the participants to identify areas in their work life requiring attention and to give them the skills to address and change those risk factors themselves. The hope was that, by making the examples universal and incorporating them into activities of daily living, this would increase compliance and long term use of the information (Bernaards *et al*., 2006, Fenety and Walker, 2002, Campbell *et al*., 2001).

The intervention programme was to be presented to the experimental group participants in the form of an education booklet and computer based "Break Software".

3.2.1 Booklet Development

In designing the intervention booklet the researcher put forth a list of topics from the literature review to be covered in the intervention booklet. This included information on RSI including a definition, the aetiology and symptoms and intervention methods. Ergonomic information and work station design as well as information on computer stretches and computer generated "Break Software" was also included. A pilot panel of experts was asked to comment, add or delete any of the suggested topics to establish content validity.

RSI predictors or risk factors from Bernaards *et al*., (2006) RSI@WORK formed the basis of the booklet:

- coping with high work demands
- optimal body posture and appropriate work place adjustments
- quality and number of breaks taken

WitSETD

3.2.1.1 Pilot study 1 Content validity of interactive education based ergonomic programme booklet with experts

A pilot study was conducted to design and develop the ergonomic programme and assess the content validity of the programme.

Participant Selection

In order to establish the content validity of the programme 10 leading South African occupational therapists and physiotherapists, who were specialists in the upper limb were contacted via email.

The guidelines used for choosing the panel of experts were that all therapists:

- were required to have run their own private hand therapy practices for in excess of five years
- had to have represented the South African Society for Hand Therapists (SASHT) on a regional or national level
- had to have participated in postgraduate courses on a regional or national level
- had to have post graduate education in hand therapy – either from a national or international source

Ethical Considerations

Ethical considerations were applied in that all experts were asked to verbally consent to participate and were asked whether or not they could contribute academically to the design of an intervention booklet for upper extremity RSI in call centre workers. The experts who agreed to participate were advised that they could withdraw from the pilot research group at any time. Their input and intellectual generosity was acknowledged as was the fact that they were participating as unpaid volunteers.

Research procedure

A brief descriptive outline of the proposed research project was provided to each expert. Information such as the target audience, type of questionnaire to be used, type of intervention proposed and physical outcome measurements to be used was elaborated on.

WiSETD

It was impossible to meet face to face due to the geographical distances between therapist. Thus all interaction was either telephonic or via email. Initial brainstorming sessions conducted covered topics to be included in the intervention programme. The researcher proposed several suggestions of topics to be covered as based on salient points from the literature. The main leading influence in the design of this intervention was the project by Bernaards *et al*., (2006). This intervention was modelled very closely on their RSI@work proposal. However the choice of final topic selection was led by the panel of experts. Topics as suggested by the researcher did not differ much from the final list of topics as proposed by the panel of experts. The main point of difference being that the researcher wanted to add more information on the therapeutic treatment of RSI. The panel did not deem this necessary as the aim of the intervention was to be a self administered cost effective preventative intervention as opposed to information on how professionals could treat the symptoms.

On collaboration of all feedback received the following were suggested for inclusion:

- information on RSI (definition, aetiology, symptoms and intervention methods – therapeutic, lifestyle modification and the like)
- ergonomic information and pictures detailing work station changes to be made
- information on computer stretches and
- information on computer generated “Break Software”

The researcher then designed an electronic version of the basic intervention booklet – using the topics as suggested by the panel of experts. This was then e-mailed to each expert on the panel for comment and criticism. The booklet was again modified Based on the feedback received.

Feedback included: comments on the language usage (e.g. either too medical or pitched too low), layout, length of chapters and the need for illustrations. The main advice provided was to develop a form of summary and “check” for the research participants. As the intervention was to be conducted without any participation from the researcher, it was advised that there be a form of “checking” the participation level of the research participants.

Thus on advice from the expert panel, a weekly summary and question checklist was developed and added to the booklet. This was added to assist the research

WISETD

participants in clarifying the weekly topic covered, to form a quick reference to allow ease of implementation of the booklet/programme and would serve as a non-intrusive means of assessing the compliance, understanding and ease of implementation of the booklet/programme.

This version was then e-mailed back to the expert panel for comment. The comments received covered areas such as: language use, medical terminology and definition accuracy, depth of the content and the feasibility of the success of the conservative treatment ideas put forward.

The comments and suggestions were collated and the modified version was then emailed back to the expert panel for yet further comment. It was agreed that custom drawn pictures as opposed to pictures copied from several sources would make the booklet easier to follow, more appealing and easier to implement. Several picture styles were sourced from other texts and web sites and some as drawn by the researcher.

An independent artist was then interviewed and several brainstorming sessions were held between the researcher and the artist commissioned to draw the explanatory pictures in the style chosen. A computer programme was used in the production of the art work. One artist was used. This allowed a consistency and individual style to develop and be carried through to all the art in the booklet.

These pictures were inserted as an addition to the text. This was done to make the medical nature of some of the content easier to understand. They also augmented and explained several of the exercises used in the conservative treatment approach. Thus the pictures included those on: anatomy, ergonomic layout, computer related stretches and those used as general explanatory aids to some of the text. These pictures were loosely based on those found in several information booklets and computer programmes on RSI prevention and management.

The final version, including the pictures, was emailed to the expert panel for final comment. No additional comments or changes were suggested. All experts were of the opinion that this version was ready to be piloted.

WISETD

3.2.1.2 Pilot study 2. Content validity of interactive education based ergonomic programme with similar participants

A pilot sample population similar to that of the final research population had to be identified.

Participant Selection

Ten individuals of various education levels working with computers, for more than three hours a day were contacted telephonically and information pertaining to the research and the pilot was offered to them verbally. These individuals were sampled by convenience. None of them was involved with the research or any research in the field of occupational therapy. The following inclusion criteria were used.

Inclusion criteria

- Individuals of different sexes and races were included
- Academic level of the pilot participants ranged from secondary to tertiary education
- The age band was similar to that of the final sample population – ranging from early twenties to mid fifties
- All potential pilot participants had to use a computer for work purposes (more than three hours per day)
- The participants could not be receiving treatment from a therapist (occupational therapist or physiotherapist) for an RSI
- The participants could not to be pregnant
- The participants could not suffer from a previously diagnosed auto immune disorder
- The participants could not be therapists (practising or retired)
- The participants could not form part of the final study

Thus, similar inclusion criteria existed for the pilot participants and for the final research participants.

Ethical Considerations

WISETD

Participants were contacted and received a written information sheet detailing the information provided in the meeting. (Appendix I). Participants were asked to give verbal consent and their confidentiality was ensured. They could withdraw from the study at any time without consequence.

Research procedure

Once suitable participants had been identified, they were asked to participate in the study. In order to assist with the decision making, a brief over-view of the study and their role and the requirements of their time was provided.

Each potential participant was then contacted personally. All questions and explanations regarding the pilot study, the research study, the potential pilot participant's role and time expenditure were handled in a face-to-face manner. It was hoped this personal communication would minimise the potential for dropping out of the study and would give the researcher better insight into the comments of each pilot participant.

Each participant received a copy of the booklet in the format as passed by the expert panel. The booklet was however printed in black and white as opposed to the colour version to be used in the final booklet version, to minimize printing costs. The pilot participants were informed that the final booklet version would be in colour and an example of one of the colour pictures was provided for comparison purposes. The pilot participants were given the same length of time for the completion of the booklet as the final participants would be given six weeks. They too were requested to implement the computer programme on a daily basis. The website for the chosen programme was provided in the booklet.

The main difference from the final research implementation was the fact that the pilot participants were able to ask the researcher questions at any stage. This was done to aid in the clarification process and to ensure that all difficulties encountered were dealt with. Thus the pilot participants were able to contact the researcher at any stage in the six week implementation period should they have needed advice or clarification.

The pilot participants were encouraged to write and draw on the pilot booklets as they felt necessary or to illustrate suggested changes or where discrepancies lay.

WISETD

This would aid the researcher in identifying specific areas where the participants had battled or misunderstood the content or questions. A comment form was provided to each pilot participant. (Appendix N) The same comment form was used for each week of the intervention and thus each chapter of the intervention booklet.
Headings for comment included:

- length of the booklet
- length of each chapter
- content
- language
- ease of implementation
- user friendliness
- layout
- pictures

The pilot participants were asked to comment on the general layout of the booklet, the layout of each chapter, the ease of implementation of each chapter and the booklet as a whole and finally the academic pitch or tone of the booklet.

Comments and suggestions received included:

- the booklet was too long and not in easy to understand terminology
- not enough explanations of the medical terms
- need for a definition of terms section at the front of the booklet
- a preference for colour in the booklet as opposed to black and white print
- a need for a checklist at the end of each section.

Thus the pilot participant agreed with the panel of experts that a checklist would be important to assist in testing their level of understanding of the topics covered.
This information was collated and the final version of the booklet was developed using suggestions as put forward by the expert panel and the pilot panel. The final version of the intervention booklet was printed in colour (to aid identification with, and understanding of the images and exercises). (Appendix J)

WitsETD

2.3.2 Computer based "Break Software"

The literature by Viscchers *et al*., (2004) suggests that paper driven passive interventions are less successful than interventions that include computer breaks. Several ergonomic programmes were reviewed using the internet. The majority of the ergonomic programmes allow a free one month trial period for single user use. After this time the user has the option to purchase the programme. Package deals for companies are also available.

The researcher reviewed several programmes for:

- ease of downloading onto a computer
- ability to customise settings and exercises
- ease of customising settings and exercises
- amount of information provided to the user about the exercises and breaks/reminders
- ability to remove the exercise/reminder from the screen
- whether the exercise or reminder prevented the use of the keyboard
- ability to track key strokes and time spent without breaks
- cost to individual and company

Several computer break software packages were tried and tested by the researcher to assess ease of use and benefit to the user. The most user friendly and seemingly beneficial programme, RSI-Shield at www.rsishield.com was chosen to be included in the intervention package.

Once the package was chosen, the researcher installed it onto a private laptop and worked within the confines of the programme. The breaks/exercises of the chosen programme had the option to freeze the keyboard and screen or not. This was important as freezing the screen and keyboard of the call centre workers would seriously impact on their work efficiency and quality when dealing with callers. The user could also easily remove the exercise/stretch before completion by simply touching any key on the keyboard.

As the package was free for a one month trial download no express permission was required. However the researcher advised the IT department to review the usage requirements and determine that no laws were being infringed. This was done and it

WISETD

was decided to download a version per computer as opposed to a company package to prevent any infringements. This was in line with the expert opinion that each experimental group participant should have the programme loaded on to their own computer. Should the download be successfully completed by the time it was to be used, there would be no implications on the booklet efficacy.

WitsETD

PHASE 3

3.3 Intervention Phase

This phase included the following:

- allocation of participants to an experimental or control group
- implementation of the interactive education based ergonomic programme with the experimental group
- measuring the effect of the interactive education based ergonomic programme using clinical assessments (ROM, and strength of the wrist as well as pinch and grip strength) and pain (static and dynamic).

3.3.1 Research design

This study was a randomised control trial. Randomly selected experimental and control groups were compared before and after an intervention period of six weeks, with measurements at baseline, three weeks and on termination of the intervention. This design controls for internal validity in terms of maturation, pre-testing, measuring techniques, experimental mortality and interaction of factors. By comparing an experimental group and a control group, the change in RSI over time (maturation) as well as effects of anticipation of the participants at pre-testing as to what to report, were controlled for. The same measuring techniques were used for both groups so the homogeneity of the groups could be ensured to allow for the interaction of other factors to be analysed.
Experimental mortality was controlled as far as possible by assessing and applying the intervention in the participants' place of work.

This phase included the implementation on the interactive education based ergonomic programme to treat upper extremity RSI as well as the assessment of the effect of the ergonomic programme on symptomatology of RSI in call centre workers.

3.3.1.1. Selection of research participants

Due to the number of eligible participants and their distribution throughout the several call centres, it was not possible to randomise call centres as originally

WitsETD

suggested. There would not have been sufficient participants available if the call centres were randomised. All eligible participants (from the seven call centres – of the same medical aid company- in one building) were therefore randomised into control and experimental groups.

Computer generated random numbers were assigned to the call centre workers that had met the inclusion criteria and had signed the informed consent form.(Appendix G) Sealed envelopes containing an information sheet and the designation of control or experimental groups were used. The researcher was blinded to this allocation process, as it was performed by an uninvolved third party.

Each screening pack received was reviewed individually. Those that were incomplete had not been completed at all or where the participants had not signed the consent, were separated from the remainder of the packs. The remainder were evaluated for the inclusion criteria. Thus, screened call centre workers who had signed the informed consent, completed the questionnaires and who had met all the inclusion criteria were to be included in the first evaluation session. (Appendix H)

A total of 39 participants out of the 129 who returned questionnaires were included in the intervention phase of the research.

To select workers eligible to participate in the study, the following criteria were used:

Inclusion criteria

- Frequent computer use of a minimum of three hours per day, three days per week
- Frequent or chronic pain or discomfort within a period of the past one month and/or preceding two weeks
- Continuous employment by the company for duration of the study
- Not under treatment by a doctor or therapist for any upper extremity disorder

Exclusion criteria

- Previously diagnosed avocational or systemic diseases e.g. rheumatoid arthritis, SLE (and or other similar conditions)
- Pregnant at time of commencement of the research project

WitsETD

3.3.1.2 Sample size

In phase three, the statistician determined that a sample of at least 20 participants per group would have power in excess of 95% to detect a difference, between the intervention and control groups, of 20 points. This would be a change of 20 points from baseline when testing at the 0.05 level of significance. A standard deviation of 16.7 was assumed. This is the total possible change divided by the six i.e. 100/6 with the six following from the fact that the total range constitutes six standard deviations.

3.3.2 Ethical considerations:

Ethical clearance for the project was obtained from the Ethics Committee for research on Human Subjects at the University of Witwatersrand. (Ethics number M070433) (Appendix F) Each participant was provided with an information sheet explaining the study and (Appendix G) informed consent was obtained and participants were assured of confidentiality by allocating a computer generated number to be used on all data collection sheets. Participants were invited to participate and informed that non-participation would have no consequences. Withdrawal from the study would also carry no consequences. It was made clear that there were no consequences from the company, related to work requirements and participation in this study. The workers were free to choose if they wished to participate and were able to refuse to participate or pull out of the study at any time. No additional pressure was placed on the call centre workers, nor was incentive offered to participate by the company or the researcher. Results were made available to interested parties on request once the results were analysed.

3.3.3 Measurement techniques

3.3.3.1 Pain

A Visual Analogue Scale (VAS), developed in conjunction with the statistician to ensure sensitivity, was used. (Appendix E)

This version of the VAS had been completed by several of the researcher's patients to determine the ease of understanding of the instructions. Thus a mini pilot had been conducted prior to the use of the VAS in this part of the research.

WISETD

Modifications had been made to ensure sensitivity and understanding by all participants. These modifications included increasing the verbal instructions or explanations given to the participants and clarifying the written instructions. The modified VAS was passed in the protocol stage of this research.

Pain intensity was assessed using an 11-point numerical rating scale, ranging from 0 “no pain” to 10 “severe pain” (von Korff, Deyo, Cherkin and Barlow, 1993). (Appendix E)

3.3.3.2 Wrist active range of motion (AROM)

The ROM of wrist flexion, extension, ulnar and radial deviation was assessed on the affected limb. To ensure accuracy and efficiency, line drawings were used at the time of the assessment. Measurements in respect of degrees, using a standard goniometer, were done by the researcher at a later stage. This was done to decrease the time spent away from the call centre by each agent. It is also described as a more efficient, precise manner of measuring as opposed to measuring the ROM with a gonionmeter on the patient. The same goniometer was used for all research participants at every assessment session by the researcher ensuring intra-rater reliability (Armstrong, MacDermid, Chinchalkar, Stevens and King, 1998). (Appendix B)

3.3.3.3 2 Pinch strength

A standardised calibrated pinch gauge was used and only lateral pinch was measured. The Preston pinch gauge was recalibrated by an expert company prior to commencement of the research. For the duration of the research the gauge was only used on the research participants. Each participant was to squeeze the pinch gauge three times, each measurement was documented. An average of the three attempts was accepted (Mathiowitz, Kashman, Volland, Weber, Dowe and Rogers, 1985). (Appendix C)

WiSETD

3.3.3.4 Grip strength

Grip strength was measured, using a standardised calibrated Preston dynamometer while the participant was seated with the shoulder in 90% flexion and the elbow in full extension. The dynamometer was recalibrated by an expert company prior to commencement of the research. For the duration of the research the dynamometer was only used on the research participants. Each participant was to squeeze the dynamometer three times, each measurement was documented. An average of three attempts was accepted (Mathiowitz *et al*., 1985). (Appendix D)

3.3.3.5 Working conditions and health at call centres questionnaire

The questionnaire chosen was the "Working conditions and health at call centres" (National Institute for Working Life) (National Institute for Working Life, 2005).

Question sub sections include:

- background questions including the number of children under seven years at home. Lifting these children can affect RSI (National Institute for Working Life, 2005) (questions 1-16)
- working hours and remuneration (questions 17-24)
- duties (questions 25-33)
- computer work (questions 34-38)
- disruption and technical support (questions 39-40)
- management, social support and development (questions 41-43)
- job requirements (questions 44-45)
- call logging and monitoring (questions 46-47)
- stress and tiredness (question 48)
- sleep (questions 49-50)
- winding down and recovery (questions 51-52)
- work/life balance (questions 53-54)
- summary (questions 55-57)
- health (questions 58-68)

The questionnaire is filled in by means of a cross in the appropriate box. The questionnaire was coded using a simple numbering technique.

The full version of the questionnaire was completed by all participants at baseline (T0) and Time 2(T2) at six weeks. As questions 1 through 24 were baseline

WitsETD

demographic questions that were deemed not to change over the six week trial period, the participants were not requested to complete them again at T2. Thus questions 25 through 68 were completed at T2 by all participants.

Questions from question 24 onwards are presented on a Likert scale of 1-5 and 1-6 with codes. Some questions were simple “Yes” and “No” answers and others divided into 10 options with percentages from 0 - 100%.

The questionnaire was coded and scored and the results analysed and compared between the two groups, the two time periods and within the groups and times.

3.3.3.6 Checklist

Adherence to the intervention was measured by attendance at all measurement sessions for control and experimental groups and handing in of weekly summary questions for the experimental group. (The weekly summaries and checklists were located at the end of each chapter of the intervention booklet). The checklist was designed to be a self test mechanism for the participants. It was hoped the compliance would be increased by introducing a sense of responsibility to the researcher in the form of the checklist (Campbell *et al*., 2001). The main intention of the checklist was to aid the participants in understanding and thus in implementing the intervention. As such, they were requested to complete and hand in the checklist weekly when receiving the next chapter of the intervention. There was no consequence to not handing in or completing the checklists. They were reminded and encouraged to hand in the checklists at each assessment session. Unfortunately, the researcher was not able to collect or hand out the weekly chapters thus could not encourage the completion of the checklists. Several of the participants reported not enough time at work to complete the intervention and the checklist.

3.3.4. Research procedure

The researcher was not allowed direct contact or access to the research participants via email or telephone. Thus the resource planning manager was provided with a list of names of the participants for the intervention phase. An intervention phase assessment pack was compiled by the researcher. This pack contained: the full version of the above mentioned questionnaire, a Visual Analogue Scale (as designed for this study) and an informed consent and information sheet. These

WiSETD

documents were placed in sealed white envelopes, to be handed out by the resource planning manager. These packs were collected, from the participants by the resource planning manager, a week prior to the assessment date and made available to the researcher. Any documents not received were requested at the assessment session.

The information sheet invited participants to participate in the study and informed consent was obtained from all participants prior to commencement of this part of the study. Once they had signed the consent appointments were set up through the resource planning manager to start assessments. It was her responsibility to organise the shifts and ensure time off the call lines so as to allow the assessment to take place.

No information was provided to the research participants as to whether they were control or experimental group members. They were also constantly reminded not to discuss the project with co-workers.

3.3.4.1 Assessment procedure

The initial baseline assessment session was to take place within one month of receipt of the screening questionnaire and signed written consent. However due to problems at the company in terms of organising their staff in relation to their projected work load, the start date for the initial assessment was delayed. It was not delayed by a substantial amount (less than three months.)

The resource planning manager organised a room and time table to be used for the initial assessment. Research participants were provided with a time to be at the assessment and granted a reprieve from the call centre. However due to the fact that the participants were from various call centres within one building, there was a delay in some attending the assessment session. The delay was due to the distance the participants had to walk to attend the session. This time was not factored in to the time off the call centre queue by the resource planning manager. Another reason for the delay was that some participants were on the phone dealing with medical aid member queries at their allotted assessment time. Both of the above delayed the assessment session markedly.

WitsETD

On presentation at the assessment session, all participants were checked for the completion of the assessment documentation. On completion of the above documentation, the research participants underwent a non-invasive physical assessment of the ROM, pain, pinch strength and grip strength in the affected upper limb. This physical assessment represented the primary outcome variables, listed below in detail. Dominance was detailed as part of this assessment, however only the affected limb was assessed.

All primary outcome variables (as outlined above) were assessed three times: - baseline (T0), at the end of three weeks Time one (T1) and at six weeks Time two (T2), for both groups. For the experimental group, assessment at T1 was mid-way through the intervention programme implementation and T2 was post intervention programme implementation.

In the second and third evaluation sessions the same primary outcome measures were assessed for both experimental and control groups. However, to overcome delay experienced in T0, the researcher and third party were allowed access to the call centres. A team leader was located and provided with a list of names required for the assessment. The resource planning manager was provided with these names and reminded to organise the time off for the participants one week prior to each assessment session. The team leader together with the researcher organised the participants' presence at the assessment. The break area of each call centre was used for the assessment at T1 and T2.

In addition to the physical outcomes measured, the full questionnaire was provided to both groups at the final session (T2). All other procedures were replicated as for T1.

WISETD

3.3.4.2 Implementation of the Intervention

On completion of the physical assessment, the participants were given the next assessment date. They were reminded not to discuss the research or the intervention booklet (should they be in the experimental group) with any co-workers.

The control group continued to work and complete avocational activities as normal. They had no knowledge of the intervention programme being performed by their colleagues.

The experimental group's intervention consisted of an educational information booklet which included:

- information on RSI (definition, aetiology, symptoms and intervention methods – therapeutic, lifestyle modification etc).
- ergonomic information and pictures detailing work station changes to be made.
- information on computer stretches as adapted from M Mayfield, "Computer Comfort Stretches" 1989. Pictures as drawn by the independent artist were used to illustrate this.
- information on computer generated "Break Software" The website for free trial download was provided (Appendix J).
- a weekly summary and checklist for completion by the research participants were included at the end of each chapter. These were to be returned to the researcher weekly.

The experimental group was provided with a chapter of the intervention booklet each week. These were placed in sealed envelopes. The third party was responsible for writing the names of the participants on the envelopes. These were handed to the resource planning manager who in turn handed them out appropriately. She too was responsible for collecting the weekly checklist at the same time. The experimental group was urged to read and implement the information in each week's chapter.

During the implementation of the programme the experimental research participants were required to load the break software on to their computers.
The researcher was advised to forward information regarding the break software to the contact persons. They were then to forward it to the IT department for advance testing so as to allow the programme to be installed on the computer systems without hampering the security firewall system in place at the medical aid company. This was done to ensure that when the programme was needed it could be rolled out easily and installed on all the experimental group computers without delay. No feedback was received from the medical aid company contacts as to the progress of the computer programme installation other than it had been handed over to the IT

WISETD

department, despite numerous requests for confirmation that the programme could be implemented on the medical aid company system.

The researcher was advised that the programme would be checked according to the IT policies of the company. Should it not pass the stringent requirements in terms of virus safety etc, an alternative was supplied for consideration. The assessment of the software was not carried out by the company at this point.

Several attempts were made by the researcher to learn the reasons for this. None was provided. At the commencement of the study, the researcher still had not obtained permission for use of the specified software in the research. However verbal was provided that the testing was being undertaken and that no negative feedback had been received from the IT department regarding the roll out of the programme onto individual computers.

Thus it was severely delayed by the medical aid company's IT department. Despite several requests it was not rolled out on time. It was however rolled out one week after the research participants needed to implement it. The independent third party member was able to warn the experimental participants of this delay, to ensure the programme was installed as soon as it became available. The third party checked that the experimental participants had loaded the programme and were utilising it.

All participants were thanked, in writing, for their participation in the research project.

3.3.5 Control of Variables

The included participants could not be undergoing treatment and hence receiving testing for an RSI. Thus any pre-testing or learning would be excluded. The same tester, test equipment and test method were used for each interaction for each participant. All participants would be exposed to the test material for the same length of time. Should a participant drop out of the study, their information would only be used up to and including that point in time. All included participants were randomly assigned either to the control or experimental designation. The work environment, quality of the equipment and breaks were standardised throughout the company.

WISETD

The call centres were uniform in respect of work hours, call rate and length monitoring and break monitoring and enforcement. The work ethos between the departments was the same.

History and maturation was controlled by pre-testing and making participants aware that if they received intervention in terms of occupational therapy or physiotherapy or medical management, this needed to be reported to the researcher. They would then be excluded from the study from that point onwards. No research participant reported having received expert therapeutic advice from a therapist during the course of the experiment. The third party was responsible for checking this with each participant at each of the assessment sessions.

They too were involved in the completion of a standardised questionnaire which was compared at the onset and the termination of the programme. Physical outcome measures were evaluated to prevent bias and incorrect reporting by the call centre workers.

The extent to which each work station could be modified was the same too. The desk could not move in orientation to the worker or chair. It too could not be adjusted for height or tilt. The chairs could be adjusted for height and rake tilt. Arm rests were standard on all chairs and could not be adjusted for height or length. No foot rests were available for any worker. The computers used were the same across all the workers. The screen angle could be adjusted but the height could not.

No direct therapeutic input was done by means of checking implementation at work or home. Since the project ran over a six week period for each participant it was expected that experimental mortality would be low. The orientation on the desk of the key items, namely: telephone, headset, key board and computer screen, could be adjusted to an extent. The workers could adjust for handedness and move their keyboards closer to or further away from the desk edge. This was limited to an extent as the cord lengths were uniform and not long enough to allow much movement.

WiSETD

Thus despite the fact that several call centres within a single medical aid company were used, the physical homogeneity of the environments could be assured. This excluded the environment as an extraneous variable that could not be controlled for.

3.3.6 Data Analysis

The information of any participants that was lost (declined to continue in the study) was included in the study up to that point as this would prove an important indicator of rehabilitation and prevention compliance.

Demographic data was analysed using descriptive statistics and the experimental and control groups were compared to ensure there were no significant differences between them in demographics.

All measurements that were assessed as well as the questions on the full questionnaire were compared for the control and experimental groups both pre test and post test with significant differences being established using Fishers exact test.

Since the questionnaire consisted of 68 questions with several long sub questions, the results for the questionnaire were screened and some questions on the questionnaire were not analysed. Questions relating to demographics, working hours, duties, computer work, stress and tiredness, work/life balance and health were assessed. It was decided that assessing all the questions would introduce many more variables and the effects and changes would be hard to align with any one aspect of the intervention. Only questions relating to RSI symptoms were compared individually using Fisher's exact test to establish the change in the percentage of replies for each choice on the Likert and other scales.
Chi-square values were obtained on the McNemar test and the non parametric Stuart-Maxwell tests to establish if there was symmetry in the answers of the total group and the experimental and control groups on the repeated measurements in the questionnaire. These tests are used to assess whether there is change in the answer from Time 0 to Time 2 and whether the change occurred in a particular direction that is a lower or higher score for each item.

WISETD