The impact of wearing VDU glasses versus progressive glasses on musculoskeletal and visual complaints in VDU workers with work-related neck complaints: A randomized controlled trial

Masterproef deel II voorgelegd tot het behalen van de graad van Master of Science in de Revalidatiewetenschappen en Kinesitherapie

Lieselotte Saeys

Promotor: Prof. dr. Barbara Cagnie
Copromotor: Drs. Birgit Castelein
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Dankwoord


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List of abbreviations

BMI: Body Mass Index
C7: Seventh cervical vertebra
CVS: Computer Vision Syndrome
FHA: Forward Head Angle
FSA: Forward Shoulder Angle
Hz: Hertz
N: Newton
NDI: Neck Disability Index
N/m: Newton per meter
N/s: Newton per second
PPT: Pressure Pain Threshold
RCT: Randomized Controlled Trial
VAS: Visual Analogue Scale
VDU: Visual Display Unit
VFQ: Visual Fatigue Questionnaire
The impact of wearing VDU glasses versus progressive glasses on musculoskeletal and visual complaints in VDU workers with work-related neck complaints: A randomized controlled trial

Lieselotte Saeys

1. Abstract (English)

**Background:** Many Visual Display Unit (VDU) workers not only experience musculoskeletal complaints, but also eye discomfort and vision problems when working with the computer for a long period. This phenomenon is called Computer Vision Syndrome (CVS) and implies an association between vision and musculoskeletal complaints, such as neck pain.

**Objectives:** The goal of this study was to investigate the impact of type of glasses on musculoskeletal and visual complaints in VDU workers with work-related neck complaints.

**Methods:** A randomized controlled trial with a parallel group and a cross-over design was conducted with 40 subjects, males and females between 45 and 62 years old. The treatment group (n=22) was given progressive VDU glasses (Zeiss® Officelens Plus) while the comparison group (n=18) was given progressive glasses (Zeiss® Multifocaal Precision Plus). The subjects were tested during a VDU task before and five months after receiving the new glasses. The following parameters were measured: the Neck Disability Index (NDI), the Visual Fatigue Questionnaire (VFQ) score, the trapezius muscle’s viscoelastic muscle properties, the trapezius’, levator scapulae’s and infraspinatus muscles’ Pressure Pain Threshold (PPT) and the Forward Head and Shoulder Angle (FHA, FSA).

**Results:** Neither of the groups’ results showed significant differences in the NDI and the VFQ scores after five months. No significant differences in viscoelastic muscle properties were found either. A significant increase of the left and right trapezius’, levator scapulae’s and infraspinatus muscles’ PPT at rest was found in both groups after five months, but the right trapezius muscle’s PPT in the progressive glasses group was significantly higher. A significant increase of the PPT of the left and right levator scapulae and infraspinatus muscles was found during the VDU task in the progressive glasses group after five months. No significant differences in FHA and FSA were found between both groups after five months. The VDU glasses group reported a significantly higher suitability of the glasses for VDU work while the progressive glasses group reported a significantly higher suitability of the glasses for far vision.

**Conclusion:** When comparing progressive VDU glasses with progressive glasses there were no differences found in self-reported neck disability and visual fatigue and in viscoelastic muscle properties, pain sensitivity and head inclination during a VDU task. VDU glasses had a
significantly higher suitability for VDU work while progressive glasses had a significantly higher suitability for far vision.

2. Abstract (Nederlands)

Achtergrond: Vele beeldschermwerkers ervaren naast musculoskeletale klachten ook visuele klachten bij langdurig beeldschermwerk. Dit fenomeen wordt ‘Computer Vision Syndrome’ (CVS) genoemd en impliceert een verband tussen visus en musculoskeletale klachten zoals nekpijn.

Doelstellingen: Het doel van deze studie was om de impact van een bepaalde bril op musculoskeletale en visuele klachten te onderzoeken bij beeldschermwerkers met werkgerelateerde nekklachten.

Methode: Een gerandomiseerde gecontroleerde trial met een ‘parallel group’ en een ‘cross-over’ design werd uitgevoerd op 40 proefpersonen, mannen en vrouwen tussen 45 en 62 jaar oud. De behandelingsgroep (n=22) kreeg een progressieve computerbril (Zeiss® Officelens Plus), de controlegroep (n=18) kreeg een progressieve bril (Zeiss® Multifocaal Precision Plus). De proefpersonen werden getest tijdens een computertaak vóór en vijf maanden na het ontvangen van de nieuwe bril. De ‘Neck Disability Index’ (NDI), ‘Visual Fatigue Questionnaire’ (VFQ) score, visco-elastische spiereigenschappen van de musculus trapezius, ‘Pressure Pain Threshold’ (PPT) van de musculus trapezius, levator scapulae en infraspinatus en de ‘Forward Head Angle’ (FHA) en ‘Forward Shoulder Angle’ (FSA) werden gemeten.

Resultaten: Er werd geen significant verschil in NDI en VFQ score gevonden tussen de twee groepen na vijf maanden. Er werd eveneens geen significant verschil in de visco-elastische spiereigenschappen gevonden. Er werd een significante stijging van de PPT van de linker en rechter musculus trapezius, levator scapula en infraspinatus in rust gevonden in beide groepen na vijf maanden, maar de PPT van de rechter musculus trapezius was significant hoger in de progressieve bril groep. Er was een significante stijging van de PPT van de linker en rechter musculus levator scapulae en musculus infraspinatus in de progressieve bril groep tijdens de computertaak na vijf maanden. Er werd geen significant verschil in FHA en FSA gevonden tussen de twee groepen na vijf maanden. De computerbril groep rapporteerde een significant hogere geschiktheid van de studiebril voor beeldschermwerk, de progressieve bril groep rapporteerde een significant hogere geschiktheid van de studiebril om ver te zien.

Conclusie: Bij het vergelijken van een computerbril met een progressieve bril werd geen verschil gevonden in zelf gerapporteerde nekklachten en visuele klachten en in visco-elastische spiereigenschappen, pijngevoeligheid en inclinatie van het hoofd tijdens een computertaak. De
computerbril had een significant hogere geschiktheid voor beeldschermwerk en de progressieve bril om ver te zien.

3. Keywords

Visual display units, visual discomfort, Computer Vision Syndrome, musculoskeletal illness, neck pain.

4. Introduction

Over the past years, the use of computers and other digital electronic devices has increased dramatically worldwide. The use of visual display units (VDU) is often accompanied by physical complaints of the neck, shoulder, forearm and hand, especially in people who make extensive use of computers at work. In a cohort study among Dutch VDU workers the two-year follow-up prevalence rates for neck complaints were 31%, 33% for shoulder complaints, and 21% for forearm/hand complaints [3]. A Finish study found the annual incidence of neck pain among VDU workers to be 34.4% [10] and a Swedish study reported an incidence rate of the first episode of neck pain of 36 new cases per 100 person-years [16]. One of the main predictors for neck and shoulder complaints was the number of working hours per day involving a computer [3].

Many VDU workers not only experience musculoskeletal complaints, but also eye discomfort and vision problems when working with the computer for a long period. This phenomenon is called Computer Vision Syndrome (CVS). According to the American Optometric Association the most common symptoms associated with CVS are eyestrain, headaches, blurred vision, dry eyes, neck and shoulder pain. These symptoms can be caused by poor lighting, glare on a digital screen, improper viewing distances, poor seating posture, uncorrected vision problems or a combination of these factors [20]. Between 64% and 90% of VDU workers experience visual symptoms [12].

Few studies have investigated the impact of wearing specific glasses on neck pain in VDU workers. Today a large variety of glasses to correct several kinds of vision problems is available. Myopia, or nearsightedness, is a condition in which objects on a far distance appear blurred. Generally it occurs during childhood and progresses until the age of 20 [22]. Hyperopia, or farsightedness, is a condition in which close objects don’t come into proper focus [21]. In astigmatism, which can co-occur with myopia or hyperopia, vision becomes blurred at any distance [19]. All these conditions can co-occur with presbyopia, which is also characterized by the inability of focusing on close objects. However, this condition usually manifests itself between the age of 40 and 45 and is a natural part of the ageing process [23]. When one of these conditions occurs solitarily, single-vision glasses are prescribed by the
ophthalmologist, e.g. reading glasses for a person with presbyopia. When two or more conditions co-occur, the ophthalmologist prescribes more than one type of glasses or glasses that correct several vision problems, e.g. progressive glasses that provide a continuous range of focal power between near and far distances, also called multifocal glasses [24].

The use of computers in workplaces is increasing every year and the age of retirement has recently increased to 67 years in Belgium, so more and more VDU workers will need glasses for a large part of their career. With the increase of computer use, specific VDU glasses have been developed. They are characterized by providing a clear vision of the intermediate zone at a distance of approximately 70 centimeters, which allows a person to see the computer screen clearly without the need for excessive focusing effort or unhealthful postures. This distance is closer than distant vision at a distance of more than 2 meters (e.g. driving), but further than near vision at a distance of 40 centimeters (e.g. reading). Progressive glasses have some lens power for this intermediate zone as well, but this zone might not be large enough for comfortable and ergonomic VDU work [18]. VDU glasses are often progressive glasses as well, so they can be used to read and/or see things clearly beyond the computer screen during VDU work (Figure 1).

![Figure 1. Progressive VDU glasses.](image)

The choice of glasses for VDU work does not only influence vision but also body posture and as a consequence muscle load and pain during VDU work. A study of Becker et al. (2007), which compared progressive glasses with single-vision glasses, found greater degrees of change in forward head posture and occipital extension when wearing progressive glasses. The authors
suggested that there might be a greater risk for musculoskeletal disorders and headaches because of these postural changes [2]. In an observational study of Jaschinski et al. (2015a) possible differences in CVS based on the use of different types of glasses to correct for presbyopia were identified. The authors found a strong increase in visual complaints associated with longer duration of VDU work, especially in subjects with presbyopia who had no correction for this condition. They also found a significantly larger head inclination when wearing progressive glasses compared to wearing single-vision glasses for far or near vision. However, the increased head inclination was not associated with an increase in musculoskeletal strain [7]. In another study of Jaschinski et al. (2015b) progressive glasses were compared with VDU glasses. A significantly lower head inclination and better vision of the computer screen when wearing VDU glasses was found. Finally, 44% of the subjects preferred the use of VDU glasses. This preference depended on individual optometric parameters, the requirement of the task and the user’s personal preference [8]. Balci & Aghazadeh (1998) investigated the impact of wearing bifocals during a VDU task and found a significant increase of neck discomfort when wearing bifocals [1]. Horgen et al. (1995) investigated the effect of wearing progressive VDU glasses for three months compared with wearing single-vision glasses and found a significant reduction in trapezius load when wearing single-vision glasses. This is why, according to them, single-vision glasses should be recommended for VDU work. However, it is noted that single-vision glasses may visually isolate the subject from tasks requiring different viewing distances [4]. In another study Horgen et al. (2002) compared three types of progressive VDU glasses and single-vision glasses during a VDU task and found no significant differences in muscle load between these four lens types [5]. Later Horgen et al. (2004) set up a randomized controlled trial (RCT) and also compared three types of progressive VDU glasses and single-vision glasses, worn for one year, and found a significant reduction of neck pain with one type of the VDU glasses as well as high rates of satisfaction with two types of the VDU glasses and the single-vision glasses [6]. Several variables were measured in the aforementioned studies, e.g. muscle load, head inclination, Visual Analogue Scale (VAS) for visual discomfort and musculoskeletal pain, scores of questionnaires concerning visual and musculoskeletal complaints and lastly preference for glasses or discomfort during a VDU task. None of these studies used other objective variables next to the VAS to measure pain, for example the Pressure Pain Threshold (PPT). Only one study compared progressive VDU glasses with progressive glasses, but both glasses were only worn for two weeks, so the adaptation time was rather short. Only two studies had a sufficiently large follow-up. In order to fulfill the need for more objective measurements and larger follow-up periods, an RCT was set up with the following research questions.

1. What is the impact of wearing progressive VDU glasses versus progressive glasses on self-reported neck disability and visual fatigue?
2. What is the impact of wearing progressive VDU glasses versus progressive glasses on viscoelastic muscle properties, pain sensitivity and head inclination during a VDU task?

Based on previous research a lower degree of head inclination can be expected when wearing VDU glasses, with a possible decrease in muscle load and neck pain. In addition, it is hypothesized that wearing VDU glasses also decreases visual complaints since people have to perform less excessive focusing efforts to properly read the computer screen.

5. Methods

5.1. Subjects

Sixty-five VDU workers were recruited from a financial holding in Ghent by means of informative posters in all of the building’s elevators. The supervising physician of the study screened all subjects for eligibility to participate in the study. Fifteen subjects were not eligible. The study was approved by the Ghent University Hospital’s ethics committee. Written informed consent was obtained from all participants.

- Inclusion criteria
  - Males and females between 45 and 65 years old
  - Minimum 4 hours a day and 20 hours a week of VDU work
  - Work related neck/shoulder complaints
  - Difference in spectacle correction for presbyopia and myopia of minimum 1.5 dioptres

- Exclusion criteria
  - Active eye disease that can’t be corrected with eyeglasses
  - Medication that strongly influences eye or muscle function

5.2. General design

This was an RCT with a parallel group and a cross-over design. A power of 0.99 was calculated with a post hoc analysis, based on an effect size of 0.43, an alpha level of 0.05 and a sample size of 40 participants. The 40 participants were randomly assigned to the treatment or control group using a block randomization in order to have an equal size and sex distribution in each group. The first six men whose eyes were examined were randomly assigned to the treatment (n=3) or control (n=3) group by the optometrist. The same procedure was done with the first six women. This procedure was repeated until all participants were assigned to one group. The treatment group was given progressive VDU glasses (Zeiss® Officelens Plus), specially designed for VDU work, and the control group was given progressive glasses (Zeiss® Multifocaal Precision Plus). Spectacle frames of Silhouette® were used and an eye examination was performed by a
graduated optician optometrist. Because of the nature of the study, it was not possible to blind the participants for the intervention, since VDU glasses can only be used during VDU work, whereas progressive glasses can be used all day long. The researchers who tested the participants couldn’t be blinded either for the same reason, since only the participants using the progressive glasses would arrive at the test location wearing their glasses. A questionnaire concerning visual and musculoskeletal complaints was completed at the beginning of the experiment. Participants were tested with their old glasses in a landscape office while performing a 20-minute VDU task. The viscoelastic properties (MyotonPRO®) of the trapezius muscle and the PPT (Wagner™ FDX 50 hand-held pressure algometer) of the trapezius, levator scapulae and infraspinatus muscles were measured before and after the task. A 2D video analysis was performed during the task, using a Logitech® webcam with a Zeiss® Tessar HD 1080p lens and MaxTRAQ software. The Forward Head Angle (FHA) and the Forward Shoulder Angle (FSA) were measured afterwards [13]. After this the participants were asked to fill out a short questionnaire every two weeks for two months. Two months after the first test moment, the participants received their new glasses and were asked to wear these for five months during VDU work. During this period the same short questionnaire had to be filled out every two weeks. At the end of this period the test procedure was repeated when wearing the new glasses. A shorter version of the first questionnaire was completed at the end of the experiment. An overview of the study procedure is given in Table 1.

5.3. Test procedure

To avoid bias of the results, all participants were tested in the morning. They were asked in advance not to use alcohol, nicotine and caffeine 24 hours before the test procedure and not to take painkillers 48 hours before the test procedure. They were also asked not to perform intensive physical activity 24 hours before the test procedure. Participants were tested in an office landscape, two at a time, one sitting behind the other, with the line of sight parallel to the window (Figure 2). Glare was reduced by the use of sunblinds and sufficient light was provided by Philips TBS 411 1x28W lamps. Computer screen, chair and table height were adjusted individually with the top of the screen at or just below eye level and 90° of flexion in the elbows, hips and knees (Figure 3). The subjects performed a 20-minute typing task. An unknown text, instructions of a medicine, was given on the left side of the screen. The subjects were asked to type this text in a blank document at the right side of the screen, using the computer mouse to scroll down in both documents only.
Table 1. Flowchart of the course of the study.
A questionnaire including the Neck Disability Index (NDI) was completed at the beginning (pre) and at the end (post) of the study. The NDI was developed by Vernon & Mior (1991) and is the most strongly validated instrument for assessing self-rated disability in patients with neck pain today [15]. The NDI consists of ten questions concerning pain and daily living activities such as lifting, reading, driving, etc. and the maximum score is 50. The interpretation of the NDI is given in Table 2. The test-retest reliability is shown to be good (Pearson’s r=0.89). The NDI
scores correlated moderately high with VAS scores (0.60) and scores of the McGill Pain Questionnaire (0.69-0.70) [14]. The Dutch version of the NDI was used in the current study [9] and is added in the appendix [25].

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Table 2. Interpretation of the Neck Disability Index.

5.4.2. Visual Fatigue Questionnaire

A questionnaire including the Visual Fatigue Questionnaire (VFQ) was completed before receiving the new glasses (pre) and every two weeks after receiving the new glasses (post1-12). The VFQ was developed by Raiabi-Vardaniani et al. (2014). The questionnaire consists of 15 questions that have to be answered on a VAS ranging from zero to ten. It enquires eye strain, impaired vision, impaired eye surface and problems outside of the eyes, e.g. headache. The maximum score is 10. The content validity index is 0.75 and the correlation between the results of the questionnaire and the Visual Fatigue Meter, a device that measures the eye fatigue changes, is -0.87 [11]. In this study, the questionnaire had been translated to Dutch. However, the reliability and validity of this version has not yet been examined. The interpretation of the VFQ is given in Table 3. The Dutch VFQ form is added in the appendix.

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Table 3. Interpretation of the Visual Fatigue Questionnaire.
5.4.3. **MyotonPRO®**

The MyotonPRO® is a digital device that measures tone (Hz), stiffness (N/m) and elasticity (logarithmic decrement) of a muscle. The subject was asked to sit down relaxed with the hands on the thighs. The MyotonPRO® was applied on the trapezius muscle in the middle between the seventh cervical vertebra (C7) and the posterior part of the acromion on each side of the body (Figure 4). Measurements were performed twice before and twice after the VDU task, each time by the same investigator.

According to a reliability study of the MyotonPRO® on the trapezius muscle the within-day intra-rater reliability is high (ICC=0.93-0.991) while the between-days intra-rater reliability is moderate (ICC=0.600-0.848) [unpublished data].

![MyotonPRO® on the application point of the trapezius muscle in the middle between C7 and the acromion.](image)

5.4.4. **Wagner™ FDX 50 hand-held pressure algometer**

The Wagner™ FDX 50 hand-held pressure algometer is a digital device that measures the point at which pressure (N) becomes unpleasant, also known as the Pressure Pain Threshold (PPT). The subject had to sit down relaxed with the hands on the thighs. The investigator applied a pressure on a specific point of the muscle at a rate of approximately 1 N/s with a 1 cm² round rubber tip. The subject was instructed to say “yes” when the comfortable pressure changed into an unpleasant pressure. The algometer was applied on the trapezius muscle (the middle between C7 and the posterior part of the acromion), the levator scapulae muscle (superior and medial of the superior angle of the scapula) and the infraspinatus muscle (the angle between the spina scapulae and the lateral margin of the scapula), each time on both sides of the body (Figure 5). Measurements were performed twice before and twice after the VDU task.

Walton et al. (2011) evaluated the intra-rater, inter-rater and test-retest reliability of the pressure algometer in people with and without acute neck pain. The PPT of the trapezius and
tibialis anterior muscles was measured. Intra-rater reliability was almost perfect (ICC = 0.94-0.97), inter-rater reliability was substantial to near perfect (ICC = 0.79-0.90) and test-retest reliability was substantial (ICC = 0.76-0.79) [17]. In the current study all measurements were performed by the same rater.

Figure 5. Wagner™ FDX 50 hand-held pressure algometer and the application points on the trapezius (a), levator scapulae (b) and infraspinatus (c) muscles. The spine of the scapula is marked (d) as well.

5.4.5. 2D video analysis of the head posture

A 2D video analysis of the head posture was performed during the task using a Logitech® webcam with a Zeiss® Tessar HD 1080p lens and MaxTRAQ and MaxMATE software. Markers were placed on C7, the tragus and the acromion (Figure 6), to measure the Forward Head Angle (FHA) and the Forward Shoulder Angle (FSA) [13] afterwards. The webcam was positioned on a tripod, perfectly horizontal with a level meter and the distance of the webcam to the participant was standardized. The participant was recorded for 15 seconds during the 1st, 5th, 10th, 15th and 20th minute of the VDU task (75 seconds in total).

Figure 6. Markers on C7 (a), the tragus (b) and the acromion (c). FHA and FSA.
5.4.6. Satisfaction questionnaire

A short questionnaire concerning the satisfaction about the study glasses was completed at the end of the study. First of all the overall satisfaction was questioned. Second the participants had to indicate to which extent the study glasses were appropriate to use for VDU work and to which extent they were appropriate for near (e.g. reading) and far vision (e.g. looking at colleagues in the same working area). Participants had to choose between five statements. A score on a five-point scale was given afterwards.

5.4.7. Statistical analysis

Data were analysed using IBM® SPSS® Statistics version 23.0. An Independent Samples T Test was applied to reveal significant group differences. Means ± standard deviations were calculated for the normalized NDI and VFQ scores, tone, stiffness and elasticity of the left and right trapezius muscle, PPT of the left and right trapezius, levator scapulae and infraspinatus muscles and FHA and FSA. A Linear Mixed Model was applied to determine whether there were significant differences in all outcome measures between both groups. In the analysis of the NDI the between factor was group (VDU glasses vs. progressive glasses) and the within factor time (pre, post). In the analysis of the VFQ scores the between factor was group (VDU glasses vs. progressive glasses) and the within factor time (pre, post, post$^{1}$, post$^{2}$, post$^{3}$, post$^{4}$, post$^{5}$ and post$^{6}$). Six out of 12 VFQ scores measured after receiving the new glasses were used in the analysis. In the analysis of the viscoelastic muscle properties the between factor was group (VDU glasses vs. progressive glasses) and the within factor time (pre, post). In the analysis of the PPT of the trapezius, levator scapulae and infraspinatus muscles the between factor was group (VDU glasses vs. progressive glasses) and the within factor time (pre, post). In the analysis of the FHA and FSA during a VDU task one between factor and two within factors were used. The between factor was group (VDU glasses vs. progressive glasses), the first within factor was time (pre, post) and the second within factor angle (1, 2, 3, 4, 5). The residuals of the Linear Mixed Models were checked for normal distribution. A post-hoc pairwise comparison was performed using a Bonferroni correction. An alpha level of 0.05 was applied to all the data in determining significant differences. In addition an Independent Samples T Test was applied to determine significant differences in satisfaction scores and percentage of study glasses use during VDU work between both groups.
6. Results

6.1. Participants

Sixty-five participants were screened for eligibility in February and March 2015 and 40 participants (18 females and 22 males) met the eligibility criteria. Eligible participants were randomized into the VDU glasses group (n=22; mean age ± SD, 51.09 ± 4.19 years) or the progressive glasses group (n=18; mean age ± SD, 53.67 ± 3.97 years). An overview of the demographic data is given in Table 4. No significant differences were found between both groups. There were eight dropouts in the study. Three subjects from the VDU glasses group and five subjects from the progressive glasses group were not satisfied or could not use the glasses. One dropout from the VDU glasses group already used VDU glasses at the beginning of the experiment and was more satisfied with these, the other two noted that the glasses were appropriate to see the computer screen clear, but one could not see his colleagues clear and the other could not see his second computer screen, which was a laptop, clear. All five dropouts from the progressive glasses group stated that the glasses were not appropriate for VDU work. The following results were based on the data of all the remaining subjects, 19 in the VDU glasses group and 13 in the progressive glasses group.

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<th></th>
<th>VDU glasses (n=22)</th>
<th>Progressive glasses (n=18)</th>
<th>Group comparisons p-values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>51.09 ± 4.19</td>
<td>53.67 ± 3.97</td>
<td>0.055</td>
</tr>
<tr>
<td>Sex</td>
<td>9♀ 13♂</td>
<td>9♀ 9♂</td>
<td>0.577</td>
</tr>
<tr>
<td>BMI (kg/m²)</td>
<td>25.82 ± 3.89</td>
<td>25.99 ± 4.04</td>
<td>0.890</td>
</tr>
<tr>
<td>Years current job</td>
<td>15.11 ± 9.69</td>
<td>15.60 ± 12.67</td>
<td>0.892</td>
</tr>
<tr>
<td>Days of work a week</td>
<td>4.84 ± 0.68</td>
<td>4.64 ± 0.48</td>
<td>0.295</td>
</tr>
<tr>
<td>Hours of work a week</td>
<td>34.03 ± 15.48</td>
<td>39.28 ± 6.84</td>
<td>0.191</td>
</tr>
<tr>
<td>Hours of VDU work a week</td>
<td>29.55 ± 8.99</td>
<td>26.67 ± 8.57</td>
<td>0.310</td>
</tr>
</tbody>
</table>

Table 4. Descriptive data for all participants with group comparisons p-values.
6.2. Self-reported neck disability and visual fatigue

The mean NDI values of both groups at the beginning (pre) as well as at the end (post) of the study ranged between 5 and 14, which indicated a mild limitation. No significant differences were found (F=0.675, p=0.419). An overview of the mean values is given in Table 5.

<table>
<thead>
<tr>
<th></th>
<th>Pre</th>
<th>Post</th>
</tr>
</thead>
<tbody>
<tr>
<td>VDU</td>
<td>9.69±5.79</td>
<td>6.87±6.98</td>
</tr>
<tr>
<td>P</td>
<td>8.64±4.76</td>
<td>7.58±4.06</td>
</tr>
</tbody>
</table>

Table 5. Mean ± standard deviation of the NDI of the VDU glasses group (VDU) and the progressive glasses group (P).

The mean VFQ scores of both groups at every moment of the study ranged between 0.66 and 2.36 which indicated a low visual fatigue. No significant differences were found between the VFQ scores at any moment of the study (F=1.820, p=0.100) and no significant differences were found between the VFQ scores at the beginning (pre) and at the end of the experiment (post6) (F=0.287, p=0.596). An overview of the mean values is given in Table 6.

<table>
<thead>
<tr>
<th></th>
<th>Pre</th>
<th>Post1</th>
<th>Post2</th>
<th>Post3</th>
<th>Post4</th>
<th>Post5</th>
<th>Post6</th>
</tr>
</thead>
<tbody>
<tr>
<td>VDU</td>
<td>1.91±1.50</td>
<td>1.25±1.25</td>
<td>1.32±1.38</td>
<td>2.06±2.41</td>
<td>1.52±1.50</td>
<td>1.42±1.31</td>
<td>1.50±1.51</td>
</tr>
<tr>
<td>P</td>
<td>1.90±1.61</td>
<td>2.13±1.90</td>
<td>0.98±0.51</td>
<td>1.01±0.54</td>
<td>1.75±1.31</td>
<td>1.30±1.26</td>
<td>1.08±1.02</td>
</tr>
</tbody>
</table>

Table 6. Mean ± standard deviation of the VFQ scores of the VDU glasses group (VDU) and the progressive glasses group (P).

6.3. Viscoelastic muscle properties, pain sensitivity and head inclination

Trapezius muscle tone, stiffness and elasticity were measured before and after a VDU task. First of all the before (pre) measurements of the first and second test were compared between both groups. No significant interaction effect of group and time was found (p>0.05). However, both groups showed a significant increase in tone (p=0.001) and stiffness (p=0.003) of the left and right trapezius muscles after five months. No significant differences were found in elasticity of the left and right trapezius muscles (p>0.05). Secondly the differences in tone, stiffness and elasticity before (pre) and after (post) the first and second VDU task were compared between both groups. The before value was subtracted from the after value (Δ). No
significant interaction effect of group and time was found ($p>0.05$). An overview of the mean values is given in Table 7.

<table>
<thead>
<tr>
<th></th>
<th>First test</th>
<th></th>
<th>Second test</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pre task</td>
<td>Post task</td>
<td>$\Delta$</td>
<td>Pre task</td>
</tr>
<tr>
<td>Tone left (Hz)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>VDU</td>
<td>18.76</td>
<td>19.19</td>
<td>0.43</td>
<td>20.19</td>
</tr>
<tr>
<td></td>
<td>$\pm 2.64$</td>
<td>$\pm 2.19$</td>
<td>$\pm 1.23$</td>
<td>$\pm 1.95$</td>
</tr>
<tr>
<td>P</td>
<td>18.84</td>
<td>18.79</td>
<td>-0.05</td>
<td>20.17</td>
</tr>
<tr>
<td></td>
<td>$\pm 2.07$</td>
<td>$\pm 1.65$</td>
<td>$\pm 0.70$</td>
<td>$\pm 2.17$</td>
</tr>
<tr>
<td>Tone right (Hz)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>VDU</td>
<td>18.25</td>
<td>18.36</td>
<td>0.11</td>
<td>20.00</td>
</tr>
<tr>
<td></td>
<td>$\pm 2.44$</td>
<td>$\pm 1.78$</td>
<td>$\pm 1.07$</td>
<td>$\pm 1.84$</td>
</tr>
<tr>
<td>P</td>
<td>17.66</td>
<td>17.68</td>
<td>0.04</td>
<td>18.68</td>
</tr>
<tr>
<td></td>
<td>$\pm 1.72$</td>
<td>$\pm 1.26$</td>
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<td>$\pm 1.66$</td>
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<tr>
<td>Stiffness left (N/m)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>VDU</td>
<td>377.88</td>
<td>387.23</td>
<td>9.35</td>
<td>409.47</td>
</tr>
<tr>
<td></td>
<td>$\pm 74.75$</td>
<td>$\pm 60.69$</td>
<td>$\pm 36.97$</td>
<td>$\pm 56.22$</td>
</tr>
<tr>
<td>P</td>
<td>386.24</td>
<td>382.41</td>
<td>-3.83</td>
<td>416.77</td>
</tr>
<tr>
<td></td>
<td>$\pm 56.20$</td>
<td>$\pm 49.54$</td>
<td>$\pm 17.80$</td>
<td>$\pm 60.93$</td>
</tr>
<tr>
<td>Stiffness right (N/m)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>VDU</td>
<td>365.34</td>
<td>364.07</td>
<td>-1.27</td>
<td>402.82</td>
</tr>
<tr>
<td></td>
<td>$\pm 65.46$</td>
<td>$\pm 46.78$</td>
<td>$\pm 39.20$</td>
<td>$\pm 52.32$</td>
</tr>
<tr>
<td>P</td>
<td>356.31</td>
<td>353.70</td>
<td>-2.61</td>
<td>387.12</td>
</tr>
<tr>
<td></td>
<td>$\pm 50.51$</td>
<td>$\pm 42.73$</td>
<td>$\pm 38.52$</td>
<td>$\pm 54.23$</td>
</tr>
<tr>
<td>Elasticity left</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>VDU</td>
<td>1.36</td>
<td>1.36</td>
<td>0.00</td>
<td>1.32</td>
</tr>
<tr>
<td></td>
<td>$\pm 0.19$</td>
<td>$\pm 0.17$</td>
<td>$\pm 0.14$</td>
<td>$\pm 0.18$</td>
</tr>
<tr>
<td>P</td>
<td>1.38</td>
<td>1.43</td>
<td>0.05</td>
<td>1.45</td>
</tr>
<tr>
<td></td>
<td>$\pm 0.16$</td>
<td>$\pm 0.14$</td>
<td>$\pm 0.10$</td>
<td>$\pm 0.16$</td>
</tr>
<tr>
<td>Elasticity right</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>VDU</td>
<td>1.36</td>
<td>1.36</td>
<td>0.00</td>
<td>1.34</td>
</tr>
<tr>
<td></td>
<td>$\pm 0.22$</td>
<td>$\pm 0.17$</td>
<td>$\pm 0.13$</td>
<td>$\pm 0.17$</td>
</tr>
<tr>
<td>P</td>
<td>1.42</td>
<td>1.41</td>
<td>-0.01</td>
<td>1.52</td>
</tr>
<tr>
<td></td>
<td>$\pm 0.19$</td>
<td>$\pm 0.13$</td>
<td>$\pm 0.10$</td>
<td>$\pm 0.20$</td>
</tr>
</tbody>
</table>

Table 7. Mean ± standard deviation and mean difference ± standard deviation ($\Delta$) of tone, stiffness and elasticity of the left and right trapezius muscles of the VDU glasses group (VDU) and the progressive glasses group (P).
The PPT of the left and right trapezius, levator scapulae and infraspinatus muscles was measured before and after a VDU task. First of all the before (pre) measurements of the first and second test were compared between both groups. A significant interaction effect of group and time was found for the PPT of the right trapezius muscle in the VDU glasses group ($F=4.802$, $p=0.021$) and the progressive glasses group ($F=4.802$, $p<0.001$) and for the right infraspinatus muscle in the VDU glasses group ($F=5.078$, $p=0.003$) and the progressive glasses group ($F=5.078$, $p<0.001$). A post-hoc Independent Samples T Test showed a significantly higher PTT of the right trapezius muscle in the progressive glasses group at the beginning of the second test ($p=0.034$). A post-hoc Paired Samples T Test showed a significant increase of the PTT of the right trapezius muscle ($p=0.003$) and the right infraspinatus muscle ($p<0.001$) in both groups over time. A significant increase of the PPT of the left trapezius ($p=0.001$), levator scapulae ($p<0.001$) and infraspinatus ($p<0.001$) muscles and the right levator scapulae muscle ($p=0.002$) was found in both groups over time. Secondly the difference in PPT before (pre) and after (post) the first and second VDU task was compared between both groups. The before value was subtracted from the after value ($\Delta$). A significant interaction effect of group and time was found for the PPT of the left levator scapulae ($F=5.105$, $p=0.024$) and infraspinatus ($F=6.371$, $p<0.001$) and the right levator scapulae ($F=10.376$, $p<0.001$) and infraspinatus muscles ($F=6.226$, $p=0.007$). The progressive glasses group showed an increase of the PPT of aforementioned muscles with a mean difference of respectively 5.58, 7.00, 8.64 and 6.22. The decrease of the PPT of the left trapezius muscle was significantly less after the VDU task in both groups during the second test ($p=0.041$). No significant interaction effect for group and time was found for the right trapezius muscle ($p=0.769$). An overview of the mean values is given in Table 8.

The FHA and FSA were measured five times for 15 seconds during the first and second test. Afterwards the mean angle of every 15 seconds fragment was calculated. In the end five FHAs (FHA 1, FHA 2, FHA 3, FHA 4, FHA 5) and five FSAs (FSA 1, FSA 2, FSA 3, FSA 4, FSA 5) remained. No significant interaction effect of group, time and angle was found. However a significant decrease of the FHA ($p=0.001$) and a significant increase of the FSA ($p<0.001$) was found in both groups over time. Independent of group and time a significant difference was found between the first and fourth ($p=0.010$) and the first and fifth FHA ($p=0.006$). The fourth and fifth FHAs were significantly higher than the first FHA. An overview of the mean values is given in Table 9.
<table>
<thead>
<tr>
<th></th>
<th>First test</th>
<th>Second test</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pre task</td>
<td>Post task</td>
<td>Δ</td>
<td>Pre task</td>
</tr>
<tr>
<td><strong>Trapezius left (N/s)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>VDU</td>
<td>15.20</td>
<td>14.03</td>
<td>-1.17</td>
<td>18.21</td>
</tr>
<tr>
<td></td>
<td>±7.07</td>
<td>±6.88</td>
<td>±4.52</td>
<td>±9.53</td>
</tr>
<tr>
<td>P</td>
<td>19.07</td>
<td>15.35</td>
<td>-3.72</td>
<td>26.52</td>
</tr>
<tr>
<td></td>
<td>±6.48</td>
<td>±6.84</td>
<td>±4.76</td>
<td>±12.42</td>
</tr>
<tr>
<td><strong>Trapezius right (N/s)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>VDU</td>
<td>14.48</td>
<td>14.04</td>
<td>-0.45</td>
<td>18.50</td>
</tr>
<tr>
<td></td>
<td>±5.64</td>
<td>±6.22</td>
<td>±3.42</td>
<td>±7.35</td>
</tr>
<tr>
<td>P</td>
<td>17.29</td>
<td>16.78</td>
<td>-0.51</td>
<td>26.99</td>
</tr>
<tr>
<td></td>
<td>±7.11</td>
<td>±12.01</td>
<td>±6.80</td>
<td>±14.15</td>
</tr>
<tr>
<td><strong>Levator scapulae left (N/s)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>VDU</td>
<td>16.08</td>
<td>17.76</td>
<td>1.68</td>
<td>22.41</td>
</tr>
<tr>
<td></td>
<td>±9.69</td>
<td>±10.54</td>
<td>±3.92</td>
<td>±13.51</td>
</tr>
<tr>
<td>P</td>
<td>21.44</td>
<td>19.16</td>
<td>-2.28</td>
<td>30.01</td>
</tr>
<tr>
<td></td>
<td>±10.88</td>
<td>±12.70</td>
<td>±4.73</td>
<td>±12.04</td>
</tr>
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<td><strong>Levator scapulae right (N/s)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>VDU</td>
<td>17.59</td>
<td>17.70</td>
<td>0.11</td>
<td>22.96</td>
</tr>
<tr>
<td></td>
<td>±10.92</td>
<td>±8.42</td>
<td>±5.46</td>
<td>±10.73</td>
</tr>
<tr>
<td>P</td>
<td>22.22</td>
<td>20.07</td>
<td>-2.15</td>
<td>26.75</td>
</tr>
<tr>
<td></td>
<td>±15.08</td>
<td>±13.30</td>
<td>±4.31</td>
<td>±14.32</td>
</tr>
<tr>
<td><strong>Infra-spinatus left (N/s)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>VDU</td>
<td>16.47</td>
<td>17.42</td>
<td>0.95</td>
<td>20.14</td>
</tr>
<tr>
<td></td>
<td>±9.84</td>
<td>±12.42</td>
<td>±5.76</td>
<td>±12.21</td>
</tr>
<tr>
<td>P</td>
<td>20.83</td>
<td>18.45</td>
<td>-2.38</td>
<td>29.17</td>
</tr>
<tr>
<td><strong>Infra-spinatus right (N/s)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>VDU</td>
<td>18.88</td>
<td>20.29</td>
<td>1.41</td>
<td>24.73</td>
</tr>
<tr>
<td></td>
<td>±12.40</td>
<td>±15.23</td>
<td>±5.96</td>
<td>±14.06</td>
</tr>
<tr>
<td>P</td>
<td>22.35</td>
<td>19.81</td>
<td>-2.54</td>
<td>34.49</td>
</tr>
<tr>
<td></td>
<td>±16.45</td>
<td>±21.15</td>
<td>±7.29</td>
<td>±20.21</td>
</tr>
</tbody>
</table>

Table 8. Mean ± standard deviation and mean difference ± standard deviation (Δ) of the PPT of the left and right trapezius, levator scapulae and infraspinatus muscles of the VDU glasses group (VDU) and the progressive glasses group (P).
Table 9. Mean ± standard deviation of the FHA and FSA of the VDU glasses group (VDU) and the progressive glasses group (P).

6.4. Satisfaction and study glasses use

No significant difference in overall satisfaction was found (p=0.072). The VDU glasses group reported a significantly higher suitability of the glasses for VDU work (p=0.001) and the progressive glasses group reported a significantly higher suitability for far vision (p<0.001). For close vision no significant difference was found (p=0.115). An overview of the mean values is given in Table 10. No significant difference in percentage of study glasses use was found (p=0.141). On overview of the mean percentage of study glasses use is given in Table 11.
<table>
<thead>
<tr>
<th></th>
<th>VDU</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall satisfaction</td>
<td>4.22±0.81</td>
<td>3.46±1.45</td>
</tr>
<tr>
<td>Far vision</td>
<td>1.83±1.04</td>
<td>4.54±0.66</td>
</tr>
<tr>
<td>Intermediate vision</td>
<td>4.67±0.59</td>
<td>3.38±1.26</td>
</tr>
<tr>
<td>Close vision</td>
<td>4.28±0.75</td>
<td>3.69±1.25</td>
</tr>
</tbody>
</table>

Table 10. Mean scores ± standard deviation of the satisfaction questionnaire (five point scale) of the VDU glasses group (VDU) and the progressive glasses group (P).

<table>
<thead>
<tr>
<th></th>
<th>VDU</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>% study glasses use</td>
<td>96.16±6.62</td>
<td>92.22±8.08</td>
</tr>
</tbody>
</table>

Table 11. Mean ± standard deviation of the percentage of study glasses use during VDU work of the VDU glasses group (VDU) and the progressive glasses group (P).

7. Discussion

The aim of this RCT was to investigate the impact of wearing progressive VDU glasses versus progressive glasses on self-reported neck disability and visual fatigue and to investigate the impact of wearing progressive VDU glasses versus progressive glasses on viscoelastic muscle properties, pain sensitivity and head inclination during a VDU task. The overall conclusion is that there are no differences between both glasses for the investigated parameters.

Neither of the groups’ results showed significant differences in self-reported neck disability and visual fatigue after five months. This can be accounted to the high standard deviations and to the fact that all participants already had a mild limitation, according to the NDI, and a low visual fatigue, according to the VFQ score, at the beginning of the experiment.

Both groups showed a significant increase in muscle tone and stiffness of the left and right trapezius muscle at rest after five months. Neither of the groups showed significant differences in viscoelastic muscle properties before and after the VDU task. It should be taken into account that the standard deviations were too high. There was a significant increase of the PTT of the left and right trapezius, levator scapulae and infraspinatus muscles at rest in both groups after five months, but the PTT of the right trapezius muscle in the progressive glasses group was
significantly higher. A significant increase of the PPT of the left and right levator scapulae and infraspinatus muscles was found during the VDU task in the progressive glasses group after five months. The decrease of the PPT of the left trapezius muscle was significantly less after the VDU task in both groups during the second test. No significant difference in the PPT of the right trapezius muscle during the VDU task was found. The lack of clear differences between both groups can be accounted to the heterogeneous population. A significant decrease of the FHA and a significant increase of the FSA was found in both groups over time. Independent of group and time the fourth and fifth FHA were significantly higher than the first FHA. This can be explained by an increased high cervical extension and low cervical flexion and an increased protraction of the scapulae, which is a posture typically seen during VDU work.

The VDU glasses group reported a significantly higher suitability of the study glasses for VDU work and the progressive glasses group reported a significantly higher suitability of the study glasses for far vision.

Past research includes only one study that compared VDU glasses with progressive glasses. Jaschinski et al. (2015b) found a significantly lower head inclination when wearing VDU glasses which is conflicting with the results of this study. However, vision of the computer screen was judged significantly better with VDU glasses and far vision was judged better with progressive glasses which is comparable with the results of this study [8].

This study was an RCT with two groups. The response rate to the questionnaires that had to be filled out every two weeks was high in both groups, 79% in the VDU glasses group and 85% in the progressive glasses group. A sufficiently large follow-up of five months was used.

Next to aforementioned strengths, this study had several limitations. The participants and the researchers were not blinded for the intervention because of the nature of the study. Another limitation was that the kind of glasses that participants used at the beginning of the study was not taken into account. Six out of 22 participants of the VDU glasses group already used a particular kind of VDU glasses at the beginning of the study, nine used progressive glasses, six used reading glasses and two didn’t use any glasses at all during VDU work. Six out of 18 participants of the progressive glasses group already used a particular kind of progressive glasses at the beginning of the experiment, four used VDU glasses, six used reading glasses, one used glasses for far vision and one didn’t use any glasses at all during VDU work. In the two groups a comparable number of subjects already used similar kinds of glasses at the beginning of the study. Another limitation was that the study glasses were adjusted to the task-specific needs and habits of the participant. Some of the progressive VDU glasses had, beside the correction for intermediate vision, a correction for near vision and some had a correction for far vision. A last limitation of the study was the high dropout rate. Three participants dropped out in the VDU glasses group. All of them stated that the glasses were appropriated for VDU
work, but one of them preferred his old VDU glasses and the other two could not use their glasses for other job demands. Five participants dropped out in the progressive glasses group. All of them stated that the glasses were not appropriated for VDU work.

In the current study a power of 0.99 was calculated, based on a sample size of 40 participants, but eight participants dropped out. Future research with a higher sample size, to meet a high dropout rate, is needed. The kind of glasses that are used at the beginning of the study should be taken into account as well in order to have a more homogeneous population. Future studies should only include VDU workers who make use of progressive glasses during VDU work. Next to self-reported neck disability and visual fatigue and viscoelastic muscle properties, pain sensitivity and head inclination, other factors should be taken into account as well. In the current study quality of life was not questioned, but participants were able to make remarks. In the VDU glasses group some subjects reported that the glasses were not suitable for far vision and that social contact with colleagues in the same working area was strongly reduced. Others reported that the glasses were not suitable to walk with in the working area because of dizziness and reduced depth perception. In this group there was still a need to use progressive glasses beside VDU work. Some subjects reported that it was difficult to switch between both types of glasses during the day. In the progressive glasses group several subjects reported that the glasses were not suitable for VDU work and that the computer screen had to be placed in another position or that the head had to be positioned in an unnatural posture. Future research should include validated questionnaires about quality of life next to the questionnaires used in the current study. All participants had a mild limitation, according to the NDI, and a low visual fatigue, according to the VFQ score, at the beginning of the experiment. Future studies should only include VDU workers with a moderate limitation, according to the NDI, and a moderate visual fatigue, according to the VFQ score in order to have a stronger decrease.

8. Abstract in lekentaal

Vele beeldschermwerkers ervaren naast nekklachten ook oogklachten bij langdurig beeldschermwerk. Het doel van deze studie was om de impact van een bepaalde bril op nek- en oogklachten te onderzoeken bij beeldschermwerkers. Een vergelijkende studie werd uitgevoerd op 40 proefpersonen. De helft kreeg een computerbril, speciaal ontworpen voor beeldschermwerk, de andere helft kreeg een progressieve bril die corrigeert voor lezen, zien en een zone hier tussenin. De proefpersonen werden getest tijdens een computertaak vóór en vijf maanden na het ontvangen van de nieuwe bril. De spierspanning, de pijndrempels van verschillende spieren en de positie van het hoofd werden gemeten. Ook vulden de proefpersonen regelmatig vragenlijsten in over hun nek- en oogklachten. Er werd geen verschil gevonden in nek- en oogklachten tussen de twee groepen na vijf maanden. Er werd evenmin een verschil in spierspanning gevonden. De pijndrempel van enkele nekspieren in rust was na
vijf maanden hoger in beide groepen. Er was eveneens een stijging van de pijndrempel van enkele nekspieren in de groep met de progressieve bril tijdens de computertaak na vijf maanden. Er werd geen verschil in de positie van het hoofd gevonden tussen de twee groepen na vijf maanden. De groep met de computerbril rapporteerde een hogere geschiktheid van hun bril voor beeldschermwerk, de groep met de progressieve bril een hogere geschiktheid om ver te zien.
9. References


10. Bewijs van indiening bij het ethisch comité

**DOCUMENT E (scripties – Z-lijn)**

**VERZOEK TOT ADVIES VAN HET ETHISCH COMITE BETREFFENDE EEN prospectief observationeel ONDERZOEKSPROJECT OP GEZONDHEIDSGEGEvens voor het maken van scripties en Z-lijn als deel van een reeds goedgekeurd academisch onderzoek**

(enkel verzameling van patientengegevens, vragenlijsten en interviews)

Dit document moet maar 1x ingediend worden indien de scriptie of Z-lijn kadert in een eerder goedgekeurde academische studie van de promotor (staffid UZ Gent of U Gent).

De studenten moeten eerst contact opnemen met Prof.dr. R. Rubens voor verdere inlichtingen robert.rubens@UGent.be.

Wanneer de scriptie of Z-lijn niet verbonden is aan een globaal academisch onderzoek, maar enkel opgezet is voor de scriptietudent, dan moet de indiening gebeuren via de standaardprocedure (document D)

1. **TITEL VAN HET ONDERZOEK:**

   The impact of wearing VDU lengthens your program length and reduces skeletal and muscle complex in VDU workers with work related back complaints

2. **PROJECTNUMMER (EC), NAAM AANVRAGER VAN HET REEDS INGEDIENDE AKADEMISCH ONDERZOEK + DATUM GOEDKEURING:**
   - PROJECTNUMMER: 2015/0445
   - NAAM ONDERZOEKER: prof. Wannes de Cuyper
   - DATUM GOEDKEURING: 16/02/2015

3. **ONDERZOEK IN FUNCTIE VAN:**

   ☑ MASTERSCRIPTIES OF Z-LIJN
   • NAAM STUDENT(EN):
   • OPLEIDING: REVALIDATIEWETENSCHAPPEN EN KINESITHERAPIE
   • NAAM FACULTEIT: FACULTEIT GENEESKUNDE
   • EMAIL STUDENT: @UGENT.BE
   • TEL. STUDENT:
4. **SOORT ONDERZOEK**

- [X] VERZAMELEN VAN PATIENTENGEGEvens, DIE KLINISCH STANDAARD GEGEVEN ZIJN (='GEEN ENKEL AANVULLEND ONDERZOEK, BLOED- OF ANDERE STAALAFNAME')
- [ ] VRAGENLIJSTEN
- [X] INTERVIEW

5. **TAAK VAN DE STUDENT BIJ DIT ONDERZOEK:**

MEEHHELPEN MET VERZAMELEN VAN PATIENTENGEGEvens, INTERVIEW Afnemen van De PROEFFERSERSON, HELPEN ONDERZOEK VOORBEREIDEN (GEEN INTERVENTIES OF ZELF ONDERZOEK Afnemen)

6. **GEGEvens VAN De PROMOTOR + AFFILIATIE:**

- NAAM: PROF DR *Barbara Cagnie*
- FUNCTIE: ZAP
- FAC. GENEESKUND & GEZONDHEIDSWETENSCHAPPEN/ VAKGROEP
- REVALIDATIEWETENSCHAPPEN EN KINESITHERAPIE
- TELEFONNUMMER:
- FAX:
- E-MAIL: @ugent.be
- NAAM UZ DIENSTHOOFD:
  - OF NAAM VAKGROEPVOORZITTER: PROF. DR. DIRK CAMBIER

7. **PERIODE VAN HET SCRIPTIE Gedeelt (BEGIN- EN EINDDatum MAAND/JAAR)**

*Februari 2015 - mei 2016*

IK VERKLAAR DE GEHELE VERANTWOORDelijkHED VAN HET HIERBOven VErMELD PROJECT OP MUI TE NEMEN EN BEVESTIG DAT VOOR ZOVER DE HUIDIGE KENNIS HET TOELAAT, DE GEGEVEN INLICHTINGEN MET DE WERKELIJKHED OVEREENSTEMMEN.

**DE HOOFDONDERZOEKER**

**HET UZ. DIENSTHOOFD OF DE VAKGROEPVOORZITTER**

**DATUM:** 23/04/15

**NAAM:** *Barbara Cagnie*

**HANDTEKENING:**

**PROMOTOR VAN DE SCRIPTIE**

**ZO VERSCHILLEND VAN DE HOOFDONDERZOEKER**

**DATUM:**

**NAAM + AFFILIATIE:**

**HANDTEKENING:**

**NAAM STUDENT**

**DATUM:** 20/04/15

**HANDTEKENING:**
11. Appendix

11.1. Dutch version of the Neck Disability Index

Neck Disability Index (NDI)
Vernon H (1989)

**DOEL(GROEP):**
De NDI meet de invloed van nekklachten op dagelijkse activiteiten en wordt toegepast bij
volwassenen met acute, subacute en chronische
nekklachten

**OPBOUW:**
Evaluatieve en inventariserende vragenlijst
met 10 items
10 deegbereiken: pijnintensiteit, zelfverzorging,
tien, lezen, houtspij, concentratie, werk,
autoijden, slap, vrije tijd

**AFNAMEDIUREN:**
8 – 12 minuten

**BENODIGDHEIDEN:**
Invulformulier

**RANDVOORWAARDEN:**
Geen

**UITVOERING/INSTRUCTIE:**
Gesloten vragen in te vullen door patiënt.

**SCORING:**
Per item: De items worden gescrood op een
zespuntsschaal (0-5), waarbij 0 overeenkomt
met "geen beperking" en 5 overeenkomt met "de
meeste beperking".
Toelaatscore: optellen van de itemscores, range
0-50

**INTERPRETATIE:**
0 – 4 = geen beperking
5 – 14 = milde beperking
15 – 24 = matige beperking
25 – 34 = ernstige beperking
> 34 = volledige beperking

Literatuur:
2. Vos CJ, Verhagen AP, Koes BW, Reliability and responsiveness of the Dutch
version of the Neck Disability Index in patients with acute neck pain in general
3. Marchioni DM, Henderson CNR, A cross-sectional study correlating cervical
radiographic degenerative findings to pain and disability. Spine 1996; 21: 2747-
2752.
4. www.clin.com
http://www.chiro.org/forms/NDI_Explain.shtml
1. Pijn
- Ik heb nu geen pijn
- Ik heb nu weinig pijn
- Ik heb nu matige pijn
- Ik heb nu vrij hevige pijn
- Ik heb nu zeer hevige pijn
- Ik heb nu de slechts denkbare pijn

2. Persoonlijke verzorging (wassen, aan- en uitkleden)
- Ik kan goed voor mezelf zorgen zonder dat de pijn toeneemt
- Ik kan goed voor mezelf zorgen hoewel dat de pijn doet toenemen
- Voor mezelf zorgen is pijnlijk en gaat langzaam en voorzichtig
- Voor mezelf zorgen lukt goed maar vaak met enige hulp
- Elke dag voor mezelf zorgen lukt meestal alleen met hulp
- Ik kan mezelf niet aankleden; mezelf wassen gaat moeilijk en ik blijf in bed

3. Tillen
- Ik kan een zwaar gewicht tillen zonder dat de pijn toeneemt
- Ik kan een zwaar gewicht tillen, maar dat doet de pijn toenemen
- De pijn weerhoudt mij van het optillen van een zwaar gewicht van de grond, maar zou dat wel kunnen wanneer dat gewicht hoger (bijv. op een tafel) gelegen is
- De pijn weerhoudt mij ervan om zware dingen op te tillen, maar het lukt me wel om lichte tot middelzware gewichten te tillen als ze makkelijk geplaatst zijn
- Ik kan alleen zeer lichte gewichten tillen
- Ik kan helemaal niets tillen of dragen

4. Lezen
- Ik kan zo veel lezen als ik wil zonder pijn in mijn nek
- Ik kan zo veel lezen als ik wil met weinig pijn in mijn nek
- Ik kan zo veel lezen als ik wil met matige pijn in mijn nek
- Ik kan niet zo veel lezen als ik zou willen vanwege de matige pijn in mijn nek
- Ik kan bijna niet meer lezen vanwege de hevige pijn in mijn nek
- Ik kan helemaal niet meer lezen

5. Hoofdpijn
- Ik heb helemaal geen hoofdpijn
- Ik heb af en toe lichte hoofdpijn
- Ik heb af en toe matige hoofdpijn
- Ik heb vaak matige hoofdpijn
- Ik heb vaak hevige hoofdpijn
- Ik heb bijna altijd hoofdpijn
6. Concentratie
- Ik kan mij goed concentreren zonder moeite wanneer ik dat wil
- Ik kan mij goed concentreren met enige moeite wanneer ik dat wil
- Het kost mij duidelijk moeite om te concentreren wanneer ik dat wil
- Het kost mij veel moeite om te concentreren wanneer ik dat wil
- Het kost mij zeer veel moeite om te concentreren wanneer ik dat wil
- Ik kan mij helemaal niet concentreren

7. Werk
- Ik kan zo veel werk doen als ik wil
- Ik kan alleen mijn gewone werk doen, maar niet meer
- Ik kan het grootste deel van mijn gewone werk doen, maar niet meer
- Ik kan mijn gewone werk niet doen
- Ik kan bijna geen enkel werk meer doen
- Ik kan helemaal niet meer werken

8. Autorijden
- Ik kan autorijden zonder enige nekpijn
- Ik kan autorijden zo lang als ik wil met weinig pijn in mijn nek
- Ik kan autorijden zo lang als ik wil met matige pijn in mijn nek
- Ik kan niet autorijden zo lang als ik wil vanwege de matige pijn in mijn nek
- Ik kan bijna niet meer autorijden vanwege de hevige pijn in mijn nek
- Ik kan helemaal niet meer autorijden

9. Slapen
- Ik heb geen moeite met slapen
- Mijn slaap is heel licht gestoord (minder dan 1 uur wakker)
- Mijn slaap is licht gestoord (1 tot 2 uur wakker)
- Mijn slaap is matig gestoord (2 tot 3 uur wakker)
- Mijn slaap is fors gestoord (3 tot 5 uur wakker)
- Mijn slaap is volledig gestoord (5 tot 7 uur wakker)

10. Vrije tijd
- Ik kan aan alle activiteiten meedoen zonder enige pijn in mijn nek
- Ik kan aan alle activiteiten meedoen met enige pijn in mijn nek
- Vanwege de pijn in mijn nek kan ik aan de meeste, maar niet alle, gebruikelijke activiteiten meedoen
- Vanwege de pijn in mijn nek kan ik aan maar weinig gebruikelijke activiteiten meedoen
- Vanwege de pijn in mijn nek kan ik nagenoeg aan geen activiteiten meedoen
- Ik kan aan geen enkele activiteit meer meedoen
11.2. *Dutch version of the Visual Fatigue Questionnaire*

<table>
<thead>
<tr>
<th>Vraag</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. In welke mate had u een druk rond de ogen?</td>
<td>0 1 2 3 4 5 6 7 8 9 10</td>
</tr>
<tr>
<td>2. In welke mate had u het gevoel van droge ogen?</td>
<td>0 1 2 3 4 5 6 7 8 9 10</td>
</tr>
<tr>
<td>3. In welke mate had u een stekende pijn in de ogen?</td>
<td>0 1 2 3 4 5 6 7 8 9 10</td>
</tr>
<tr>
<td>4. In welke mate had u het gevoel van zware oogleden?</td>
<td>0 1 2 3 4 5 6 7 8 9 10</td>
</tr>
<tr>
<td>5. In welke mate had u tranende ogen?</td>
<td>0 1 2 3 4 5 6 7 8 9 10</td>
</tr>
<tr>
<td>6. In welke mate was u duizelig bij het kijken naar uw beeldscherm?</td>
<td>0 1 2 3 4 5 6 7 8 9 10</td>
</tr>
<tr>
<td>7. In welke mate zag u dubbel?</td>
<td>0 1 2 3 4 5 6 7 8 9 10</td>
</tr>
<tr>
<td>8. In welke mate had u een wazig zicht?</td>
<td>0 1 2 3 4 5 6 7 8 9 10</td>
</tr>
<tr>
<td>9. In welke mate had u hoofdpijn tijdens het werken?</td>
<td>0 1 2 3 4 5 6 7 8 9 10</td>
</tr>
<tr>
<td>10. In welke mate voelde u zich slaperig?</td>
<td>0 1 2 3 4 5 6 7 8 9 10</td>
</tr>
<tr>
<td>11. In welke mate had u pijn in de ogen?</td>
<td>0 1 2 3 4 5 6 7 8 9 10</td>
</tr>
<tr>
<td>12. In welke mate had u problemen met het zien van zaken op een korte afstand met een aangepaste bril?</td>
<td>0 1 2 3 4 5 6 7 8 9 10</td>
</tr>
<tr>
<td>13. In welke mate had u problemen met het zien van zaken op een lange afstand met een aangepaste bril?</td>
<td>0 1 2 3 4 5 6 7 8 9 10</td>
</tr>
<tr>
<td>14. In welke mate had u nood om de ogen te masseren?</td>
<td>0 1 2 3 4 5 6 7 8 9 10</td>
</tr>
<tr>
<td>15. In welke mate sloeg u woorden of regels over tijdens het lezen?</td>
<td>0 1 2 3 4 5 6 7 8 9 10</td>
</tr>
</tbody>
</table>