Original Article

# Utilization of Comprehensive Corrective Exercise Program for Improving Posture in Monitor-Based e-Gamers: A Quasi-Experimental Study

Angelie Joyce M. Oconer, Max Danielle D. Dimapilis, Elmer C. Bondoc

College of Physical Therapy, Manila Central University
EDSA, Caloocan City

Corresponding Author:
ajoconer30.AO@gmail.com

**Abstract**

Over the last five years, e-sports has grown rapidly, increasing the need to address e-gamer health within sports medicine, as prolonged screen exposure and sitting may lead to posture-related musculoskeletal issues. This study aimed to determine the effectiveness of a Combined Corrective Exercise Program (CCEP) in improving common postural problems among e-gamers, including forward head posture, rounded shoulders, and scapular dyskinesis. A randomized controlled trial was conducted with 20 participants aged 18–35 years presenting with postural deviations. Baseline assessment used the REEDCO Posture Assessment Tool, Flesche Postural Test, and Scapular Dyskinesis Test. Participants were assigned to either a CCEP group or a control group performing conventional stretching, with interventions conducted three times per week for four weeks. Results showed that the CCEP group demonstrated significant improvements in postural alignment, with higher REEDCO scores and lower Flesche scores compared to controls. Forward head posture and rounded shoulders improved significantly in the CCEP group. Scapular winging decreased from 50% to 20%, and scapular dysrhythmia decreased from 100% to 70%, while no improvements were observed in the control group, although these changes were not statistically significant. The findings suggest that CCEP is more effective than conventional stretching in improving posture among e-gamers. Longer intervention periods and additional assessment tools are recommended to further address scapular dysfunction and postural asymmetry.

***Keywords:*** physical therapy, postural symptoms, e-gamers, comprehensive corrective exercise program, musculoskeletal rehabilitation, sedentary lifestyle

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## Introduction

E-sports have relatively recently evolved into a widely acknowledged competitive environment at amateur and professional levels. With a likely total of over 300 million fans worldwide, the industry has grown significantly even during the global COVID-19 pandemic in 2020. As participation in e-sports rises, the inclusion of e-sports medicine in sports rehabilitation and healthcare practice is increasingly required. This includes rock-monitor-based gaming and active video gaming, each with its own physical demands and health-related challenges (Franks et al., 2022). Studies such as the one conducted by Ashok et al. (2020) have highlighted the growing problem of musculoskeletal effects from prolonged gaming. That is, prolonged sitting and focusing on computer screens can lead to poor sitting posture, especially in the neck area, and to forward head posture. Understanding how common this forward head posture is in gamers and what contributes to it is the first step towards preventing more serious musculoskeletal problems.

Generally, researchers have said excessive gaming hours, generally gaming for more than 3 hours a day, increase the risk for postural disorders (Tholl, 2022). Other literature has also identified associations between excessive gaming and the development of a forward head posture, rounded shoulders, and scapular dyskinesis. The study by Wani et al. (2021) reports a high prevalence (79%) of pain among video gamers who play for at least 13 hours per week, with the supraspinatus, levator scapulae, and trapezius muscles particularly affected. In recent years, the prevalence of UCS has increased due to the emergence of digital technologies and prolonged, incorrect sitting posture (Franks et al., 2022). Zhang et al. (2023) showed that severe internet addiction is associated with UCS, with a muscular group on the anterior and posterior of the upper body being out of balance.

Conventional physical therapy primarily involves the conservative management of movement impairment related to a specific joint and/or muscle dysfunction, focusing on restoring normal mobility, muscle strength, and length through joint mobilization, muscle-strengthening, and stretching exercises (Inductive Physiotherapy Institute, n.d.). For those with postural disorders, these interventions tend to address the negative effects of muscle shortening and weakness in antagonistic muscle groups. Newer forms of rehabilitation suggest a more holistic, movement-based approach, such as the Comprehensive Corrective Exercise Program (CCEP), which aims not only to provide symptomatic relief but also to improve muscle activation patterns, movement integrity, and postural alignment (Bayattork et al., 2020). Studies such as Bayattork et al. (2020a; 2020b), Azam et al. (2022), and Ogino et al. (2022) consistently report improvements in alignment, muscle activation, and movement patterns among individuals with UCS following corrective exercise programs.

Additionally, Azam et al. (2022) defined the CCEP as an advanced approach consisting of corrective exercises that not only reduce pain in specific body parts but also address muscle imbalances and altered muscle activation. This program addresses potential underlying sensorimotor dysfunction, offering a solution to improve posture-related musculoskeletal disorders and placing a strong emphasis on correcting dysfunctional movement patterns and enhancing overall body mechanics, which can lead to more sustainable long-term results in both pain reduction and functional improvement.

Despite the growing body of evidence supporting corrective exercise programs, only a limited number of studies currently focus on UCS, particularly among e-gamers (Mol et al., 2021). Most studies focus on general populations such as college students or office workers, and there is a lack of research examining targeted interventions like CCEP specifically for monitor-based e-gamers. Furthermore, while associations between gaming and musculoskeletal disorders are well documented, there is limited evidence on structured rehabilitation programs addressing these issues within this specific population.

Therefore, the present study sought to determine whether the Comprehensive Corrective Exercise Program would produce greater improvements in posture-related symptoms among e-gamers compared with conventional care. The study focuses on improving posture, reducing musculoskeletal symptoms, and addressing muscle imbalances associated with UCS in monitor-based e-gamers. By implementing a structured corrective exercise program, this study aims to contribute to the development of targeted rehabilitation strategies for this population.

**Figure 1**

*CCEP Exercises*

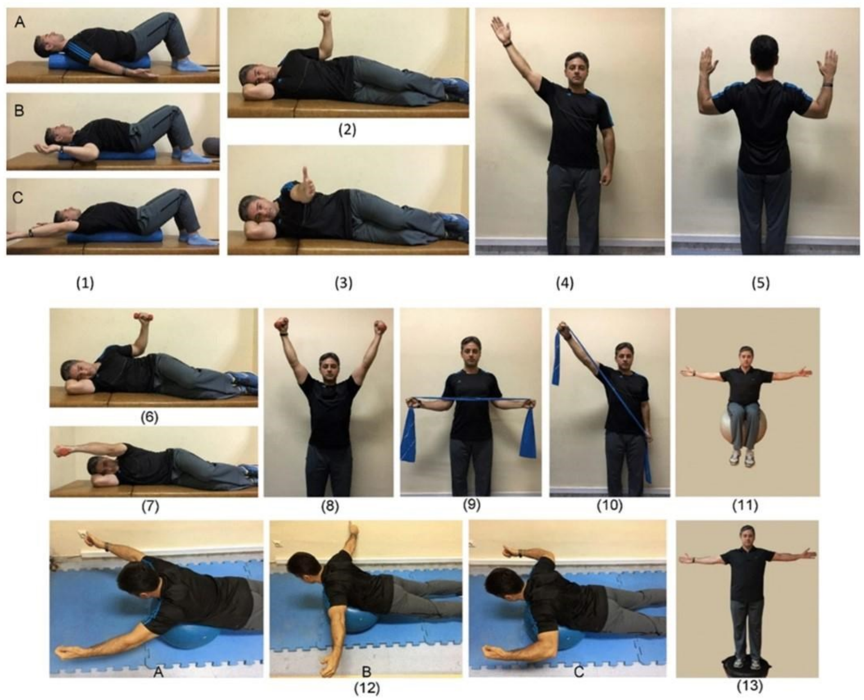



Figure 1 shows that the initial phase exercises include lying on a foam roll in three different arm abduction angles (Exercise 1A-C), side-lying external rotation (Exercise 2), side-lying forward flexion (Exercise 3), standing diagonal flexion (Exercise 4), and military press (Exercise 5). The improvement phase exercises consist of side-lying external rotation with a dumbbell (Exercise 6), side-lying forward flexion with a dumbbell (Exercise 7), standing diagonal flexion with a dumbbell (Exercise 8), standing external rotation with a Thera Band (Exercise 9), standing diagonal flexion with TheraBand (Exercise 10), abduction while sitting on a training ball (Exercise 11), lying prone V, T, and W exercises (Exercise 12), abduction while standing on a balance board (Exercise 13) (Bayattork et al.,2020a).

# Methodology

## Research Design

To measure the effect of CCEP on postural imbalance in monitor-based e-gamers, a blinded randomized controlled trial was conducted. Participants were recruited from various e-games organizations in the Philippines, schools, and gaming cafés, targeting male and female e-gamers aged 18–35 years who were active in e-games and had posture-related musculoskeletal disorders. The REEDCO Posture Assessment Scale was used to assess eligibility, with a score of 59% or less required. The Flesche Postural Test and Scapular Dyskinesis Test were also used. Subjects were decided, and then they were randomly allocated to the intervention and control groups. The intervention then was CCEP, a compilation of individually tailored exercises designed to reduce muscle imbalances, improve movement patterns, and restore postural alignment; all of these will be completed throughout 2-month sessions, at least 3 times a week, under supervision. The control group received strengthening and stretching exercises as their usual care, with no CCEP or other structured exercise applied. All groups were subjected to the REEDCO Posture Assessment Scale, Flesche Postural Test, and Scapular Dyskinesis Test throughout the intervention period to assess changes in postural imbalances. A thorough account of research ethics, including confidentiality, privacy, and measures to reduce potential harm to subjects, was provided.

## Participants

In this study, 20 monitor-based e-gamers (10 males, 10 females, aged 18-35 years) who were frequent users of shooter games and had posture-related overuse symptoms were recruited. The suspected symptoms included forward head posture, rounded shoulders, and scapular dyskinesis. Participants were recruited to obtain a representative sample via social media pages, online gaming communities, and schools. Following recruitment, a licensed physical therapist screened and determined participants' eligibility using validated assessment tools. The feasibility of the sample size and statistical power allows for a meaningful comparison within the constraints of time and available resources. This sample size was chosen because it was feasible for a pilot study to reduce variability and the likelihood that the results were due to chance. To limit selection bias, randomization to one of the groups used a fishbowl randomization, in which all participants' identification codes were written on paper and placed into a container from which assignments would be drawn at random. All participants were selected via random sampling, with an equal chance of being assigned to either group. The inclusion criteria consist of individuals aged 18–35 years who engage in prolonged gaming for more than three hours per day and actively participate in shooter games. Additionally, participants must have posture-related musculoskeletal disorders associated with monitor-based e-gaming, as confirmed through screening by a licensed physical therapist.

## Instrumentation

The tools selected for data collection in this study were the REEDCO Posture Assessment Scale, Flesche Postural Test, and Scapular Dyskinesis Test. The REEDCO Posture Assessment Tool was chosen by the researchers to assess participants' position, providing information on head alignment, shoulder posture, spinal curves, and similar components. A licensed physical therapist administered the REEDCO tool at baseline and follow-up. The Flesche Postural Test was used to assess participants' forward head posture while standing. In addition, the Scapular Dyskinesis Test, which assessed scapular winging presentation and motion (correlating with kyphosis), elevated shoulders, and protracted shoulders, was conducted. Together, these instruments provided a detailed portrait of postural alignment, postural imbalance levels, and symptom severity, enabling the authors to examine how posture affects symptoms of musculoskeletal disorders among monitor-based e-gamers.

## Intervention

Intervention group participants received the CCEP, which consisted of tailored exercises targeting specific muscle imbalances, movement patterns, and postural issues associated with posture-related musculoskeletal disorders commonly found among monitor-based e-gamers. CCEP was administered through supervised exercise sessions held three times per week for four weeks (12 sessions total) to maximize healthful effects. Main safety measures were screening health checks before participation and the provision of transport home. Each session lasted 60 minutes and was structured into warm-up, corrective exercise, and cool-down phases. The study was conducted at the MCU-FDT PT Clinic and PT Gym, which had complete instruments and accessibility. The control group received strengthening and stretching exercises but not the structured CCEP. Both groups were assessed with the REEDCO Posture Assessment Scale, Flesche Postural Test, and Scapular Dyskinesis Test, periodically throughout the intervention period, and the degree of improvement in the exercise's effectiveness, by way of reduction in postural imbalance, was noted. All exclusions were made in accordance with ethical guidelines for research involving human participants.

## Data Collection Procedure

Recognizing the need for a sound science-based method, the researchers took steps to protect the data. Participants were screened by a qualified physical therapist to determine eligibility based on inclusion criteria related to active engagement in monitor-based e-games and posture-related musculoskeletal disorders, assessed using the REEDCO Posture Assessment Tool, Flesche Postural Test, and Scapular Dyskinesis Test. Suitable candidates who scored 59% or less on the REEDCO would be randomly assigned to either the intervention or the control group. Baseline data (demographics, gaming habits, as well as initial scores on REEDCO Posture Assessment Scale, Flesche Postural Test, and Scapular Dyskinesis Test) were obtained, and the intervention (CCEP) group was then treated three times per week for four weeks in an exercise routine designed to address overactive muscles, underactive muscles, movement patterns, and postural alignment. The control group received strengthening and stretching exercises. Measurements were made weekly over the four-week treatment period. Both groups were re-evaluated after each week using the REEDCO Posture Assessment Scale, Flesche Postural Test, and Scapular Dyskinesis Test. Adherence and adverse events data were also gathered. Following the four-week treatment, a final measurement was undertaken using the same tools to assess the overall effect of the postural intervention. All data was gathered. Subsequently, statistical analysis was conducted to compare the intervention's effects on posture and postural habits between e-gamers and the control group.

## Data Analysis Procedure

To evaluate the influence of the CCEP intervention on postural outcome measures, descriptive statistics (means, standard deviations) were first used to describe sample characteristics (for both groups) and summarize changes in each postural measure and symptom prevalence week-by-week, in addition to reporting proportions for categorical data (e.g., scapular winging and dysrhythmia). Bubble plots and line graphs were also produced to aid interpretation; line graphs were used to show the average REEDCO and Flesche scores by group. Over four weeks of observation, visual inspection of these line graphs allowed the reader to inspect the direction of change". Bar charts illustrated the proportion of subjects with scapular winging and dysrhythmia by week, enabling visual comparison of group differences over time. To evaluate the effects of CCEP on continuous postural outcomes, repeated measures ANOVA was performed to assess within-subject changes in REEDCO and Flesche scores across the four weeks and to compare changes by treatment group. This approach allowed investigation of the main effects of treatment group and time (week), as well as the interaction effect of treatment by week, to determine whether CCEP had a differential impact on postural scores over time compared with standard care. For the binary outcomes of scapular winging and dysrhythmia, binomial generalized linear models (GLMs) were tested.

Considering the dichotomous nature of these outcomes (present or absent), GLMs with a binomial distribution and logit link were used to model the probability of occurrence and to assess whether CCEP, week, or their interaction statistically predicted the odds of scapular winging or dysrhythmia. Coefficients from these models estimated the change in log-odds of the outcome associated with each predictor. For the continuous postural alignment outcomes (REEDCO and Flesche scores), repeated measures ANOVA models were specified. The dependent variables were either REEDCO or Flesche scores. The within-subject factor was 'Week' (i.e., the four repeated measurements were Weeks 1, 2, 3, and 4). The between-subjects factor was 'Treatment Group', distinguishing participants who received the CCEP intervention from those in the control group. A Type III Sum of Squares approach was used. These enabled the researchers to examine within-subject change over time and the extent to which trajectories differed across treatment groups (tx groups). The interaction term 'Treatment Group x Week' tested whether the pattern of postural scores over weeks varied significantly by intervention. Assumptions of ANOVA, including that the residuals were normally distributed and that the variances were homogeneous, were checked (normality checked; QQ plots were considered visually). For the binary outcome variables (scapular winging and dysrhythmia), binomial GLMs were developed. The dependent variables were 'Scapular Winging' (present/absent) and 'Dysrhythmia' (present/absent). Predictor variables included 'Treatment Group' (CCEP vs Control), 'Week' (categorized as Weeks 1 through 4), and their interaction term 'Treatment Group: Week'. Binomial distribution (with a logit link) was specified, and maximum likelihood estimations were performed. These GLMs enabled estimation of the effect of CCEP on the odds of developing scapular winging or dysrhythmia over the study period, accounting for the effect of time and the interaction between time and intervention.

### Ethical Consideration

Participants were recruited via an informational letter sent prior to the study that detailed procedures, the type of participants the researchers were seeking, and the purpose of the study. This letter also included an informed consent form. On the day of the assessment, participants completed forms, including a demographic profile (age, sex) and an additional consent form. The demographic profile form did not request identifying names, and the study did not require signatures for the questions. In the interest of privacy and to avoid unintended harm, all personal information was treated with care, and participants were given codes in place of names. Participants' data were encrypted and stored to ensure security. Any stored data was destroyed after three years. According to ethical guidelines and the provisions of the Data Privacy Act (RA 10173), researchers informed participants that participation in the study was voluntary and that they had the right to withdraw at any time before, during, or after the study without penalty. The researchers ensured that any distress or adverse effects experienced by participants during the intervention were addressed, monitored throughout, and documented. Overall, the research was conducted in accordance with ethical principles governing human participants, respecting each participant's rights, interests, and needs.

## Results and Discussion

The results and discussion section presents the findings of the study based on the weekly assessments conducted. It highlights changes in postural measures and scapular function among e-gamers over time.

**Table 1**

*Weekly Assessments of Postural Measures and Scapular Dysfunction in e-Gamers*

| Variable | Week 1 | Week 2 | Week 3 | Week 4 |
|---|---|---|---|---|
| Reedco Score | | | | |
| *Treated* | 0.50 (0.05) | 0.50 (0.05) | 0.54 (0.05) | 0.56 (0.05) |
| *Control* | 0.50 (0.05) | 0.50 (0.05) | 0.50 (0.04) | 0.54 (0.04) |
| Flesche score | | | | |
| *Treated* | 2.86 (0.49) | 2.73 (0.50) | 2.53 (0.47) | 2.28 (0.53) |
| *Control* | 2.89 (0.48) | 2.89 (0.48) | 2.69 (0.43) | 2.46 (0.41) |
| Prop. w/ Winging | | | | |
| *Treated* | 5 / 10 (50.0%) | 5 / 10 (50.0%) | 3 / 10 (30.0%) | 2 / 10 (20.0%) |
| *Control* | 6 / 10 (60.0%) | 6 / 10 (60.0%) | 6 / 10 (60.0%) | 6 / 10 (60.0%) |
| Prop. w/ Dysarhytmia | | | | |
| *Treated* | 10 / 10 (100.0%) | 10 / 10 (100.0%) | 10 / 10 (100.0%) | 7 / 10 (70.0%) |
| *Control* | 10 / 10 (100.0%) | 10 / 10 (100.0%) | 10 / 10 (100.0%) | 10 / 10 (100.0%) |

Mean (SD); Proportion (%)

Table 1 shows the descriptive statistics of postures and symptoms frequencies across the four weeks. The REEDCO scores of postural alignment show a slight improvement in overall alignment for both groups; the CCEP group improved from 0.50 in Week 1 to 0.56 in Week 4, while the control group improved from 0.50 to 0.54. Flesche scores decreased for both groups (2.86 to 2.28 for the treated group; 2.89 to 2.46 for the control group), showing both groups improved, but the CCEP group relatively more. Regarding scapular winging, the incidence decreased from 50% in Week 1 to 20% in Week 4 in the treated group, whereas the control group showed a uniform prevalence of 60% throughout the four weeks, suggesting improved scapular stability with the CCEP intervention. The prevalence of dysrhythmia was 100% in both groups in Week 1 and decreased to 70% in the treated group by Week 4, while remaining at 100% in the control group, indicating that the CCEP is likely beneficial in alleviating dysrhythmia symptoms. In summary, all participants showed some improvement in postural alignment, but those receiving the CCEP improved a numerically larger amount and showed a significantly lower prevalence of dysrhythmia and scapular winging, supporting the usefulness of a Comprehensive Corrective Exercise Program.

**Figure 2**

*Mean REEDCO Score Trajectories for Treatment and Control Groups Across Four Weeks*

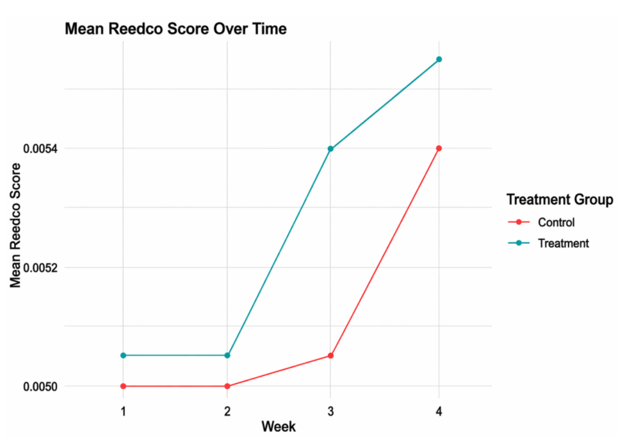
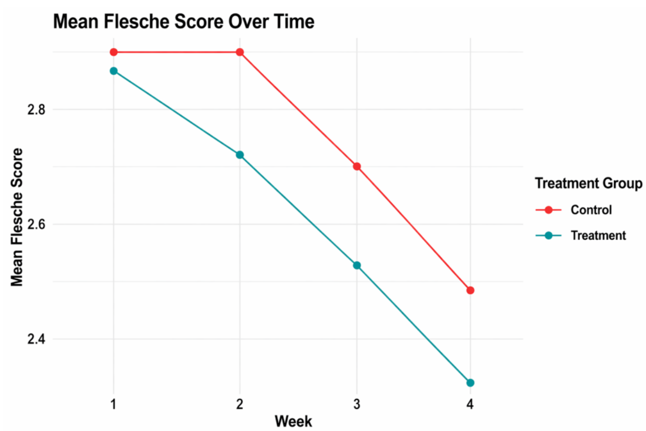



Figure 2 shows mean REEDCO scores for the experimental and control groups over the four-week duration of the trial. Both groups show a slight trend towards higher mean REEDCO scores, reflecting improvements in spinal position as measured by the REEDCO Postural Assessment Tool over the course of the study. The experimental group that received the Comprehensive Corrective Exercise Program (CCEP) exhibited a greater trajectory in their REEDCO scores, increasing at a steeper slope from Week 2 onward, compared to the control group.

**Figure 3**

*Mean Flesche Score Trends in Treatment and Control Groups Across Four Weeks*




Mean Flesche scores for the treatments and control groups for the four-week study. Both treatment and control groups present a decrease in mean Flesche scores. The lower mean scores represent better spinal alignment over time. The mean Flesche scores of the treatment group were lower than those of the control group each week, with the difference most significant by week four in the treatment group.

**Figure 4**

*Week-to-Week Change in REEDCO Scores from Baseline (Week 1 Excluded)*

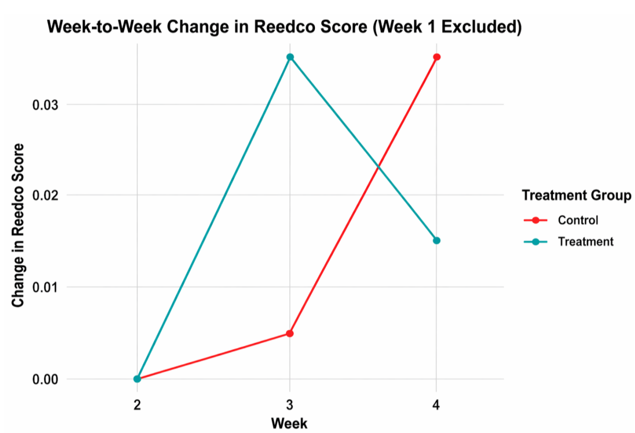



Figure 4 shows the change in REEDCO for the treatment and control groups from their Week 1 baseline over subsequent weeks. From Week 1 to Week 2, REEDCO changed only slightly for both the treatment and control groups. Between Weeks 2 and 3, the change in REEDCO increased greatly for treatment, indicating a useful improvement in postural alignment over the last week compared to earlier.

Control increased a little in REEDCO score. from Weeks 2 to 3. From Weeks 3 to 4, the change in REEDCO decreased but remained positive in treatment, indicating continued improvement, though not as much as a week prior. Control showed no increase in REEDCO from Weeks 3 to 4, close to what was observed in treatment the previous week. This illustration shows that the CCEP may improve REEDCO more quickly between Weeks 2 and 3, while the control group appears to improve earlier in the later weeks of the study.

**Figure 5**

*Week-to-Week Change in Flesche Scores from Baseline (Week 1 Excluded)*

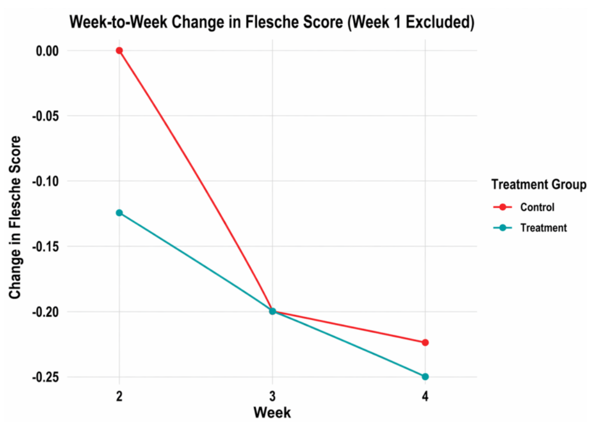
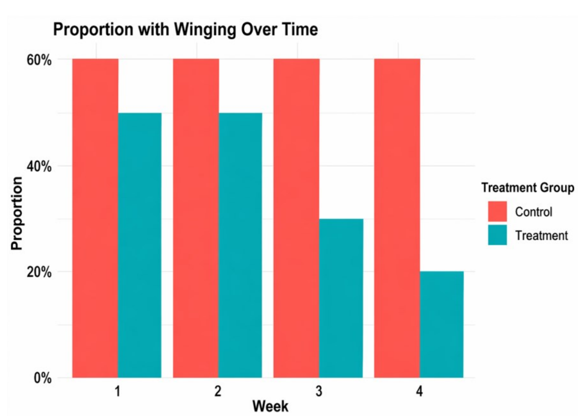



Figure 5 shows the week-to-week change in the Flesche scores from Week 1 for the treatment and control groups. The treatment group shows a greater magnitude of negative change to the Flesche score than the control group from Week 1 to Week 2, indicating that a greater spinal realignment was achieved by the treatment group at that time. The negative change in Flesche scores also continues from Week 2 to Week 3 for both groups, indicating further improvement and translating to that week. From Week 3 to Week 4, both groups have a negative change in Flesche scores; however, the change appears to lessen in both groups from the previous week. Taking all the weeks into account, the treatment group has a greater magnitude week-to-week negative change in Flesche scores meaning that progression of spinal realignment, due to the CCEP, with respect to the control intervention throughout the intervention appears to be furthered to a greater effect.

**Figure 6**

*Proportion of Participants Exhibiting Scapular Winging Over Four Weeks*



In Figure 6, the proportions of subjects with scapular winging in the treatment and control groups over the four-week testing period are shown. The control group appears to have a consistently higher proportion of individuals in winging compared to the other group. The proportion of winging in the treatment group, however, decreases at week 3 and 4.

**Figure 7**

*Proportion of Participants Exhibiting Scapular Dysrhythmia Over Four Weeks*

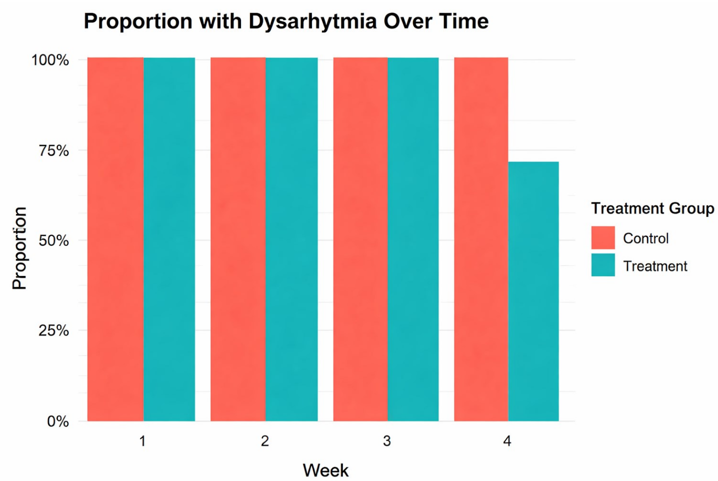



Figure 7 shows the percentage of participants who experienced dysrhythmia in both groups across the study period. The control condition had a consistent prevalence of dysrhythmia at 100%. However, the treatment group showed a decrease in the proportion of dysrhythmias at Week 4, to just under 70%. This shows a reduction in dysrhythmia symptom prevalence in the treatment group by the end of the study, whereas the symptom remained prevalent in the control group throughout.

**Table 2**

*ANOVA Results for REEDCO Scores Across Four Weeks*

| Effect | DFn | DFd | F | p-values | p<.05 | ges |
|---|---|---|---|---|---|---|
| Treatment | 1 | 18 | 0.545 | 4.70E-01 | | 0.028 |
| Week | 3 | 54 | 58.836 | 5.02E-17 | * | 0.148 |
| Treatment: Week | 3 | 54 | 6.448 | 8.22E-04 | * | 0.019 |

ANOVA results for REEDCO scores across four weeks are presented in Table 2. The week had a significant main effect on postural alignment, as assessed by the REEDCO, with improvements for both groups over time. The treatment-by-week interaction is where it gets interesting; it indicates that the "path of change" improved progressively more across weeks for the CCEP group than for the control group. Both groups improved, but CCEP improved more over the four weeks, demonstrating a change in the trajectory of postural alignment during the intervention. The trajectory of improvement is similar in timeframe to that of other similar interventions looking at various musculoskeletal conditions.

**Table 3**

*ANOVA Results for Flesche Scores Across Four Weeks*

| Effect | DFn | DFd | F | p | p<.05 | ges |
|---|---|---|---|---|---|---|
| Treatment | 1 | 18 | 0.392 | 0.539 | | 0.021 |
| Week | 3 | 54 | 305.668 | 7.62E-34 | * | 0.16 |
| Treatment:Week | 3 | 54 | 7.03 | 0.000448 | * | 0.004 |

Table 3 presents ANOVA results of Flesche scores, reflecting spinal alignment, over the four-week study. Week matters greatly, indicating that spinal alignment, as measured by Flesche scores, improved over time for both groups. Importantly, the treatment-by-week interaction indicates that this change in trajectory began to differ progressively between the CCEP and control groups. Both groups improved. However, the CCEP group exhibited a more pronounced change in spinal posture trajectory over the four weeks of the intervention. The trajectory resembles that shown when musculoskeletal conditions are addressed.

**Table 4**

*Binomial Generalized Linear Model Results for Scapular Winging and Dysrhythmia*

| | **Dependent variable:** | |
|---|---|---|
| | Winging | Dysarhytmia |
| | (1) | (2) |
| trtTreatment | -0.269 | -56.129 |
| | (1.128) | (27,156.420) |
| week | 0.000 | -0.000 |
| | (0.289) | (6,815.964) |
| trtTreatment:week | 0.489 | 19.462 |
| | (0.424) | (8,412.635) |
| Constant | -0.405 | -22.566 |
| | (0.791) | (18,666.290) |
| Observations | 80 | 80 |
| Log Likelihood | -52.066 | -6.109 |
| Akaike Inf. Crit. | 112.132 | 20.217 |
| Note: | p<0.1; p<0.05; p<0.01 | |

Table 4 presents the results of a binomial generalized linear model analysis examining how participation in the Comprehensive Corrective Exercise Program (CCEP) and passage of time influenced the presence or absence of scapular winging and scapular dysrhythmia. The coefficients estimated for treatment, week, and their interaction were not statistically significant. Therefore, we can conclude that the CCEP Treatment neither caused nor helped with the incidence rates for producing an outcome. On average, participants in the treatment group had lower odds of exhibiting scapular winging. Although the interaction term ('trt Treatment: week') indicates that the factor had positive coefficients for winging and dysrhythmia, and that treatment group members may change faster in log-odds than the respective control, this is not a statistically significant finding. Overall, the lack of statistically significant findings indicates insufficient evidence to conclude that the CCEP intervention or time altered the likelihood of participants exhibiting scapular winging or dysrhythmia over the four weeks.

Utilizing the Comprehensive Corrective Exercise Program (CCEP) Method with Monitor-Based E-Gamers places a heavy workload on the trainer. The efficacy of this Method (CCEP) was examined using a randomized controlled trial (RCT) of subjects grouped according to corrected posture, i.e., a lower RREDC score of 4 marks or greater from pre- and post-test) and the Flesche posture scale monitored for change between the control group and the CCEP methodology group. Statistically, REEDCO scores were higher (indicating a lower likelihood of a positional referral) in the intervention group than in the control group. Postural deviation/spinal alignment indicated a realignment of subjects over four weeks, where scapular dysrhythmia resolved from 100% abnormal postural status in Week 1 for CCEP participants to 70% in Week 4. The control sighted 100% at Week 4 as well. The authors observed similar results for scapular winging from a 50% to 20% reduction in the intervention group over 4 weeks and no change in the control group. Although both groups presented some improvement, the intervention group had a more gradual trend towards postural correction. However, over the 4 weeks, the results were not large enough or statistically significant to definitively conclude that CCEP is better than conventional stretching and strengthening in improving scapular winging and dysrhythmia, with the most apparent improvements seen in the latter half of the intervention, so longer lengths of treatment may be beneficial, but further research is needed to test how long these benefits last.

## Conclusion

In summary, results from this study indicate that the Comprehensive Corrective Exercise Program (CCEP) targeting Posture Induced Musculoskeletal Disorders among monitor-based e-Gamers is an effective approach and is a better intervention than normal strengthening and stretching intervention on improving postural alignment, especially of those who demonstrate forward head posture and rounded shoulder and postural alignment, towards a more balanced structure. Overall, results suggest that the Comprehensive Corrective Exercise Program (CCEP) is a more thorough intervention for posture-induced musculoskeletal disorders than providing the athlete a regimented series of strengthening and stretching exercises. This is a reminder of how vital corrective exercise programs are for those who have jobs that keep them sedentary for long periods. In particular, for e-gamers, to mitigate musculoskeletal dysfunction and therefore counter the long-term health effects of poor posture, which is common in the population.

## Recommendations

For Physical Therapists and Clinicians, it is recommended that they include CCEP in standard treatment plans for posture-related musculoskeletal disorders, especially for the slouches of society, such as e-gamers, and to assess postural measures and symptom prevalence. The recommendations may still require further editing for clarity and alignment with the study findings. The investigators thought it would be worthwhile to intervene for longer than 4 weeks to see whether the benefit would persist. Assessing the collected data, along with other EMG metrics, will continue to shed light on postural changes and muscle activation. For E-Gamers and Individuals with Sedentary Lifestyles, taking classes such as CCEP can help mitigate the harmful effects of screen time. Ergonomic action steps, such as adjusting monitor height, avoiding slouching while sitting, and getting up frequently, may help mitigate the latter. For Future Researchers, increasing the sample size to include a broader group of participants may improve the representativeness of the findings. Future studies could adopt a longitudinal design to assess the longer-term effects of CCEP on the occurrence of postural deviations. Further research into changes in CCEP across different levels of resistance and exercises may aid rehabilitation work. This study contributes to the body of postural rehabilitation work in e-gamers; it opens the scope for subgroups within that broad spectrum, and those subgroups should be offered specific forms of rehabilitation. With structured corrective exercises, these postural imbalances can be reduced, thereby reducing the risk of musculoskeletal health issues and potentially minimizing the long-term effects of posture-related musculoskeletal disorders among monitor-based e-gamers.

## References

Ashok, K., Purushothaman, V. K., & Muniandy., Y. (2020). View of Prevalence of forward head posture in electronic gamers and associated Factors |International Journal of Aging Health and Movement.https://tinyurl.com/5n6wkyrs

Asjad, A., Ashraf, I., Asif, T., & Rehman, F. (2022).Comparative Effects of Comprehensive Corrective Exercises Versus Muscle Energy Techniques in Patients with Upper Cross Syndrome: A Random ized Controlled Trial. Pakistan Biomedical Journal, 173–177.https://doi.org/10.54393/pbmj.v5i7.671

Bayattork, M., Seidi, F., Minoonejad, H., Andersen, L. L., & Page, P. (2020a). The Effectiveness of a comprehensive corrective exercises program and subsequent detraining on alignment, muscle activation, and movement pattern in men with upper crossed syndrome: protocol for a parallel group randomized controlled trial. Trials, 21(1).https://doi.org/10.1186/s13063-020-4159-9

Bayattork, M., Seidi, F., Minoonejad, H., Andersen, L. L., & Page, P. (2020b). Comprehensive corrective exercise program improves alignment, muscle activation and movement pattern of men with upper crossed syndrome: randomized controlled trial. Scientific Reports, 10(1).https://doi.org/10.1038/s41598-020-77571-4Alghadir

Franks, R. R., King, D., Bodine, W., Chisari, E., Heller, A., Jamal, F., Luksch, J.,Quinn, K., Singh, R., & Solomon, M. (2022). AOASM Position Statement on Esports, active Video Gaming, and the role of the Sports Medicine Physician. Clinical Journal of Sport Medicine, 32(3), e221–e229.https://doi.org/10.1097/jsm.0000000000001034

Inductive Physiotherapy institute. (n.d.). The three main components of conventional physiotherapy. Inductive Physiotherapy.http://www.physiotherapie-normo-inductive.fr/en/the-three-main-components-of-c onventional-physiotherapy/

Mol, N., Ashok, A., & Kumar, D. (2019). View of Upper Crossed Syndrome:Trends and Recent Advances in the Physiotherapy treatment A Narrative review. https:journaljpri.com/index.php/JPRI/article/view/5655/11319

Ogino, H., Daniel, M., & Volberding, J. L. (2022, February 18). Effectiveness of corrective exercises to improve posture in patients with upper crosssyndrome and scapula dyskinesis: a critically appraised topic.https://shareok.org/handle/11244/339539

Tholl, C., Bickmann, P., Wechsler, K., Froböse, I., & Grieben, C. (2022). Musculoskeletal disorders in video gamers – a systematic review. BMC Musculoskeletal Disorders, 23(1).https:doi.org/10.1186/s12891-022-05614-0

Wani, C. A., Vijayakumar, M., Tushar, J., & Patel, C. (2021). Prevalence of painin scapular muscles in video gamers. ResearchGate.https://www.researchgate.net/publication/355584609_Prevalence_Of_Pain_In_Sca pular_Muscles_In_Video_Gamers