



QUALITY IN SPORT

eISSN 2450-3118 · Open Access · Peer-reviewed

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DZIEWIĘCKA, Oliwia, ZIĘBKA, Wojciech, MĄDRZAK, Julia, MARKOWSKI, Bartłomiej, IWASZKO, Magdalena, STOJKO, Julia, SKAJEWSKA, Marcelina, KWIECIŃSKI, Wojciech, KACZMAREK, Julia, KUJAWA, Julia, and POZNANSKA, Nela. Digital Eye Strain in Esports Athletes: Blink Suppression, Ocular-Surface Symptoms, and Binocular Vision Findings – A Narrative Review. *Quality in Sport*. 2026;71:75062. <https://doi.org/10.12775/QS.2026.71.75062>

ARTICLE TIMELINE

Received: 06.08.2026. Revised: 27.08.2026. Accepted: 05.09.2026. Published: 13.09.2026.

The journal has been awarded 20 points in the parametric evaluation by the Polish Ministry of Higher Education and Science (Annex to the announcement of 05.01.2024, No. 32553). Unique Journal Identifier: 201398. Scientific disciplines assigned: Economics and Finance (Field of Social Sciences); Management and Quality Sciences (Field of Social Sciences).

Punkty Ministerialne z 2019 – aktualny rok 20 punktów. Załącznik do komunikatu Ministra Szkolnictwa Wyższego i Nauki z dnia 05.01.2024 Lp. 32553. Posiada Unikatowy Identyfikator Czasopisma: 201398. Przypisane dyscypliny naukowe: Ekonomia i finanse (Dziedzina nauk społecznych); Nauki o zarządzaniu i jakości (Dziedzina nauk społecznych). © The Authors 2026.

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Digital Eye Strain in Esports Athletes: Blink Suppression, Ocular-Surface Symptoms, and Binocular Vision Findings – A Narrative Review

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Abstract

Background: Competitive esports requires prolonged near-screen viewing and sustained visual attention, making digital eye strain (DES) clinically relevant to players.

Aim: To synthesize direct evidence from esports and gaming-task studies with clearly labeled indirect evidence on symptoms, blinking, the ocular surface, accommodation, vergence, risk modifiers, clinical assessment, and management.

Material and methods: This focused narrative review integrated publications from 2015 through 1 July 2026, including direct esports and gaming-task studies and clearly identified indirect evidence from other screen-user populations. Interpretation considered study design, population, outcomes, directness, and limitations.

Results: Direct esports and gaming-task studies support acute worsening of symptoms, task-related blink suppression, and selected short-term or cross-sectional differences in near-vision measures. Evidence of chronic ocular disease, irreversible injury, or effects on competitive performance remains insufficient. Symptoms, objective ocular signs, and dry eye disease are distinct outcomes.

Conclusions: Assessment should be symptom-led and should address ocular-surface, refractive, binocular, and ergonomic contributors. Breaks and ergonomic adjustments are reasonable low-risk measures, but blue-light-filtering lenses and the exact 20-20-20 schedule should not be presented as proven treatments.

Keywords: digital eye strain; computer vision syndrome; esports; competitive gaming; ocular surface; binocular vision

1. Introduction

Digital eye strain (DES) is best understood as a multidomain clinical syndrome rather than a single disease. It may include external ocular-surface complaints, internal accommodative or binocular complaints, and extraocular discomfort such as headache or neck and shoulder symptoms [1]. A player may report burning, dryness, fluctuating blur, difficulty refocusing, periocular ache, or headache, but these complaints do not necessarily share a single mechanism. Screen-related discomfort should therefore not be treated automatically as dry eye disease or as an undifferentiated form of visual fatigue.

Studies in general screen-user populations show that these complaints are common, but they provide no estimate of prevalence in esports. Two large meta-analyses reported pooled computer vision syndrome estimates of approximately two-thirds; however, between-study heterogeneity approached 100%, case definitions differed, and most evidence was cross-sectional [2,3]. Large occupational surveys examined populations, exposure patterns, and symptom-only definitions that differ substantially from competitive gaming [4,5]. These findings establish that screen-related symptoms merit clinical attention, but they should not be presented as the expected prevalence among esports athletes.

Measurement is a central challenge because reported DES prevalence varies with the questionnaire, threshold, sampling frame, age, and clinical exclusion criteria. Investigator-designed checklists and validated instruments do not necessarily measure the same construct, and neither alone establishes ocular disease [6]. The practical question is which symptoms and functional changes occur in defined gaming contexts.

Competitive players may combine organized practice with recreational screen use, producing long and sometimes uninterrupted viewing bouts. In one survey of 65 collegiate esports players, respondents described multi-hour practice, prolonged sitting, and low physical activity [7]. A cross-sectional Thai comparison of 76 male esports athletes and 74 controls found self-reported computer vision syndrome more often in the esports group, but selection, confounding, and study design preclude causal interpretation [8]. Exposure assessment should include total gaming time, uninterrupted bouts, task demands, and recovery.

The direct evidence from esports and gaming-task studies is much smaller than the literature on office workers, students, and children. A recent narrative review of professional esports health identified only 12 heterogeneous records across several health domains [9]. Esports cohorts provide direct esports evidence, controlled gaming tasks provide direct gaming-task

evidence, and studies in other screen-user populations provide only mechanistic or clinical context.

This review focuses on the pathway linking attention-related blink suppression and ocular-surface disturbance with accommodative and vergence complaints during competitive gaming. It connects gaming-task physiology with clinical interpretation, evidence-calibrated management, and a proposed clinical assessment framework while preserving distinctions among symptoms, signs, diagnoses, associations, mechanisms, and intervention effects. By separating direct esports evidence from gaming-task and general screen-user evidence, it aims to support responsible eye care within athlete-health and training environments without assuming an unproven effect on competitive performance.

2. Materials and Methods

This focused narrative review used a literature search and qualitative synthesis across reviews, consensus reports, surveys, esports comparisons, gaming experiments, occupational studies, and small interventions. It was not designed as a systematic review or meta-analysis; therefore, PRISMA was not applied.

PubMed/MEDLINE was used as the primary bibliographic database. PubMed Central, Europe PMC, publisher websites, and institutional repositories were used to retrieve eligible full texts. The search covered publications from 2015 through 1 July 2026, which was the date of the final search update. Publications appearing after this date were not considered. Search concepts combined esports or gaming with digital eye strain, computer vision syndrome, visual fatigue, dry eye, blinking, accommodation, vergence, ergonomics, breaks, the 20-20-20 rule, and blue-light filtering.

Eligible records were English-language, peer-reviewed full-text publications relevant to at least one review domain: clinical definition or measurement, esports or gaming exposure, blink or ocular-surface mechanisms, accommodation or vergence, risk modifiers, clinical assessment, or management. Abstract-only records, duplicates, retracted articles, commercial pages, and papers without a defensible link to the review question were excluded.

Evidence was synthesized qualitatively without pooling. Study design, population, principal findings, directness, and major limitations were recorded before synthesis. Esports cohorts were classified as direct esports evidence and controlled gaming tasks as direct gaming-task evidence. Pediatric, non-desktop, occupational, and general screen-user studies were treated as indirect evidence with explicit limits on transferability. Cross-sectional differences were

described as associations, acute changes were not interpreted as chronic injury, and symptoms were kept separate from objective disease.

3. Clinical Definition and Measurement

Clinically, DES can be organized into external ocular-surface symptoms, internal accommodative or binocular symptoms, complaints from other ocular conditions, and ergonomically related discomfort [10,11]. This overlapping framework guides history-taking rather than diagnosis. Blurred vision, for example, may arise from tear-film instability, refractive error, accommodative stress, binocular dysfunction, or another ocular disorder.

Attribution to digital viewing requires a compatible temporal pattern: symptoms develop, recur, or worsen during the task and improve or change when exposure is modified. A low blink rate, short tear break-up time, or abnormal convergence measure alone is not diagnostic of DES [12]. Conversely, clinically meaningful symptoms may occur despite normal objective testing. Assessment should begin with a task-linked history and then evaluate plausible contributors.

Validated symptom questionnaires such as the Computer Vision Syndrome Questionnaire (CVS-Q) and Computer Vision Symptom Scale improve consistency but do not replace an ocular examination or establish an ocular-surface, binocular, or esports-specific diagnosis [6,11,13]. They measure perceived symptom burden over a defined period and should be reported as symptom outcomes rather than relabeled as DED or structural visual dysfunction. The 16-item CVS-Q was developed for occupational visual display terminal users, not esports athletes. It combines symptom frequency and intensity into a severity score and provides a practical method for classifying a defined symptom pattern. In the original validation sample, a threshold of at least 6 yielded a sensitivity of 75.0%, a specificity of 70.2%, and an area under the receiver-operating-characteristic curve of 0.826 against a symptom-based reference classification [14]. These values indicate moderate classification performance in that setting, not an objective disease test or a universal esports cutoff.

Questionnaire scores and ocular signs must remain separate. In office workers assessed with a validated CVS questionnaire and three ocular-surface tests, symptom status was associated with abnormal tear break-up time but not with Schirmer II results or corneal staining [13]. This supports tear instability in some symptomatic users while showing that no single sign represents the entire ocular surface.

Dry eye disease (DED) has a more specific clinical meaning: it is a multifactorial symptomatic disease characterized by loss of tear-film and/or ocular-surface homeostasis. Transient dryness

or burning during gaming is not automatically DED. Under the current TFOS framework, diagnosis requires symptoms, at least one objective sign of homeostatic disturbance, and an appropriate differential diagnosis [15]. Examples include reduced noninvasive tear break-up time, abnormal osmolarity, and defined ocular-surface staining. These diagnostic criteria should not be repurposed as a definition of DES, but they help prevent DED from being diagnosed on symptoms alone.

Age and setting further limit transferability. A pediatric smartphone study required symptoms and signs to define DED, but its modified adult-derived threshold, school-based sample, and child-specific exposure make the observed frequency unsuitable for adult esports athletes [16]. It is useful as an example of a symptom-plus-sign design, not a prevalence benchmark.

Clinical measurement should distinguish task-linked symptoms, functional interference, objective ocular-surface findings, refractive or binocular findings, and formal diagnoses [10]. Acute laboratory changes, end-of-day changes, and persistent abnormalities are different outcomes. Timing relative to play, breaks, contact-lens wear, topical products, sleep, and environmental conditions should be recorded. Pooled prevalence figures remain a descriptive background because instruments, sampling, and selection differ [2,3].

4. Esports-Specific Evidence

Clinical evidence specific to esports is sparse. Existing reviews propose broad medical screening and injury-management frameworks, but their ocular components have not been prospectively validated for diagnostic yield, health outcomes, or performance outcomes [17]. They should be presented as provisional clinical reasoning rather than an established esports vision standard.

In the collegiate survey, 56% of 65 players reported eye fatigue, the most common complaint in the sample [7]. The ad hoc questionnaire, small self-selected sample, unclear response rate, and absence of ocular examination prevent population or diagnostic conclusions. An esports-focused clinical commentary provides useful questions on exposure and workstation conditions but no primary ocular dataset; several numerical statements derive from the same survey, so it is not independent confirmation [18].

Acute gaming experiments provide more direct gaming-task evidence. In 50 healthy young adults, four hours of continuous desktop gaming was followed by increased physical and ocular discomfort. Most measured binocular changes had recovered by the following morning, and the uncontrolled design cannot separate gaming from time, near work, fatigue, or expectation

[19]. The study documents an acute response after a demanding exposure, not chronic ocular injury.

In 36 healthy children, one hour of smartphone gaming increased symptom scores and reduced blinking. The pediatric age group, handheld viewing distance, small sample, and lack of a control condition prevent direct transfer of the magnitude to adult desktop esports [20]. Nevertheless, the study provides plausible task evidence because exposure and measurement were prospective and temporally linked.

A tablet experiment exposed 59 healthy adults to one hour of movie viewing or gaming and pooled both activities in the analysis. It therefore informs acute visual fatigue during high-resolution tablet use but does not isolate an esports-specific or even gaming-specific effect [21]. The modest changes in symptoms and tear-film measures should be interpreted within this mixed-content context.

Overall, direct esports and gaming-task evidence consists mainly of small surveys, cross-sectional comparisons, and brief exposures. The most consistent task-level signals are reduced blinking, acute discomfort, and short-term variability in near-vision function. Large longitudinal cohorts using standardized ocular-surface, binocular, and performance outcomes are lacking.

5. Blink Suppression and Ocular-Surface Mechanisms

Reduced blink rate or incomplete blinking may link sustained screen attention with ocular-surface discomfort. Longer interblink intervals permit more evaporation and local tear-film disruption, while incomplete blinks may impair tear redistribution. Baseline ocular status, contact-lens wear, airflow, humidity, viewing angle, and task demand can modify this response [1,22,23]. The mechanism is plausible, but reduced blinking alone does not establish DED.

Blinking during digital tasks depends on more than the display itself. Cognitive demand and blink completeness may be at least as important as device category or average daily screen time [10,12,24]. A player waiting in a menu, watching a slow replay, tracking several opponents, or executing a high-stakes sequence may use the same monitor but display different visual-attentional behavior. Average daily hours cannot capture these brief periods of marked suppression. Genre, scene dynamics, round structure, and opportunities to blink or look away should therefore be measured rather than assumed.

The prolonged gaming experiment provides a direct example. Blink rate decreased from 16.24 blinks per minute before play to 8.27 after one hour and 9.51 after four hours of continuous gaming, approximately half the baseline rate [19]. Ten participants lacked blink data, and there

was no non-gaming control condition; the result is therefore an acute within-person association. The study did not establish whether reduced blinking contributed to symptoms, symptoms altered blinking, or both reflected increasing task fatigue.

A more recent laboratory study compared passive gameplay viewing with active play in 20 casual gamers. Mean blink rate during passive viewing was lower than the baseline rate of 12.79 blinks per minute. During active play, rates fell further to approximately 3.7–4.3 blinks per minute across action, adventure, and sports games [25]. Active play therefore appears to create a stronger context for blink suppression than passive viewing of similar content, although the small sample and brief analyzed epochs limit generalizability.

Blink frequency and completeness should be considered separately. In the same experiment, the incomplete-blink rate did not differ significantly across conditions, although blink frequency and regularity changed [25]. This null result is clinically useful because an intuitive mechanism may not appear in every task or with every measurement method. Studies should report complete and incomplete blinks separately and specify how each was detected.

Pediatric gaming data point in the same direction but remain indirect for adult esports. During one hour of smartphone gaming, blink rate fell from 20.8 to 8.9 blinks per minute within the first minute and remained reduced. Symptoms worsened, but lipid-layer thickness, tear meniscus height, and noninvasive tear break-up time showed no clear acute deterioration [20]. The brief exposure does not inform longer-term outcomes, but it shows that symptoms and blink behavior can change without a parallel short-term change in the measured tear-film variables.

Objective findings are mixed. A small workday study compared 30 hospital computer users with 30 controls and observed reduced tear break-up time in the computer group, but the groups differed at baseline and were not randomized [26]. Schirmer tear production and OSDI symptom scores did not change significantly. Longer screen exposure is more consistently associated with dry-eye symptoms than with clinically diagnosed DED [22].

A one-hour tablet study similarly found a modest increase in asthenopia and a small reduction in tear break-up time, while total ocular wavefront aberration remained unchanged [21]. Interpretation is limited by the lack of a control group, low baseline tear break-up time, immediate-only follow-up, and pooling of movie and game tasks. The most defensible summary is that selected symptoms and tear stability changed after exposure; neither a gaming-specific mechanism nor chronic harm was established.

Several mechanisms may coexist. Attention can delay blinking, and incomplete blinks can impair tear distribution [1,12]. Gaze, airflow, humidity, contact lenses, and meibomian-gland

dysfunction can modify evaporation [22,23], while accommodative or vergence stress may produce internal symptoms without ocular-surface change. Future gaming studies should synchronize blink measures, symptoms, task phase, room conditions, display geometry, and recovery.

6. Accommodation and Vergence

Internal symptoms include eyestrain, periocular ache, headache, blur, diplopia, and difficulty changing focus. These complaints may reflect uncorrected refractive error, accommodative or vergence demand, or a mismatch between the task and the player's visual capacity. They are clinically distinct from burning or foreign-body sensation, although players may report both symptom domains.

Sustained near work may be followed by transient accommodative or refractive changes. Older screen literature describes short-lived near-work-induced myopic shifts but does not establish permanent visual injury caused by gaming [24]. Terms such as “spasm,” “fatigue,” and “dysfunction” should be used only when justified by the measurement and clinical context. A temporary change after an intensive task may represent physiological adaptation rather than a chronic disorder.

In the four-hour gaming experiment, the near point of convergence receded from 7.23 to 8.77 cm, and the near point of accommodation receded from 7.79 to 9.11 cm immediately after play. Accommodative and vergence facility also decreased, and the measured values recovered to or beyond baseline by the following morning [19]. These findings support acute, reversible variability in near-vision function. Without a control condition, they do not isolate the relative contributions of gaming, prolonged near work, time of day, or general fatigue.

Cross-sectional esports evidence addresses a different question. In the male Thai sample, selected near positive fusional vergence blur, break, and recovery values were lower in esports athletes than in controls. Monocular and binocular accommodative facility and vergence facility were also lower in the esports group, whereas distance measures were generally less distinctive [8]. Because exposure was not assigned and the groups differed in several characteristics, these observations cannot be described as deficits caused by esports.

Null findings from low-weight studies also matter. A small heterogeneous observational study comparing school pupils with ophthalmology-clinic patients found no statistically significant between-group difference in fusional amplitude [27]. The groups were not comparable, and the study cannot estimate a gaming effect, but the result argues against assuming that screen-related complaints consistently correspond to abnormal fusional measures.

Current evidence supports short-term changes after prolonged gaming and cross-sectional differences in selected tests, not a chronic binocular-vision disorder caused by esports. Persistent blur, diplopia, headache, or refocusing difficulty still warrants targeted assessment because pre-existing refractive, accommodative, or vergence problems may become symptomatic during demanding play.

Future protocols should define the test distance, target, endpoint, optical correction, and normative reference; distinguish amplitude from facility; and report the direction and magnitude of change rather than statistical significance alone. Recovery measurements are especially valuable because they help distinguish transient load responses from persistent abnormalities. Studies should also avoid translating small changes in surrogate measures into claims about visual performance during competition.

7. Risk Modifiers and Ergonomics

Potential modifiers include total screen time, uninterrupted bout length, attentional demand, viewing distance, monitor height, glare, illumination, contrast, humidity, airflow, optical correction, contact lenses, ocular history, sleep, and individual susceptibility [12,28,29]. Most supporting evidence is indirect and observational.

A meta-analysis of screen users found that longer visual-display exposure and shorter viewing distance were associated with higher odds of computer vision syndrome, but thresholds varied and the pooled estimates were not causal. Failure to take breaks was also associated with higher odds in a small, heterogeneous set of studies [28]. These associations can guide history-taking, but they do not prove that a specified viewing distance or break schedule will prevent symptoms in esports athletes.

Occupational studies illustrate potential modifiers and definitional problems. In a large Sri Lankan office sample, longer daily computer use and pre-existing ocular factors were associated with a broad symptom-defined CVS outcome [4]. An Ethiopian study similarly found associations with longer use and ocular history and inverse associations with self-reported breaks and safety knowledge [5]. Because behaviors were not randomized, these findings may reflect job structure, awareness, or responses to symptoms.

In an Italian office sample assessed with a validated CVS questionnaire, female sex, more than six hours of workplace device use, and wearing glasses at work were associated with symptom status [13]. The association with glasses should not be interpreted as evidence that spectacles are harmful. It may reflect underlying refractive needs, age, task demands, or confounding by

indication. For a player, the clinically relevant question is whether the correction is accurate and appropriate for the working distance.

A Ghanaian study combined CVS-Q screening, ocular eligibility checks, and direct measurements of workstation geometry and lighting. Poor overall workstation practice was associated with symptom status, but individual corrections were not tested and confounding was incompletely addressed [29]. Results were inconsistent across occupational studies; in the Sri Lankan survey, breaks and viewing distance were not consistently associated with symptoms, and higher ergonomics knowledge showed an unexpected positive association [4]. Age-specific evidence requires especially strict boundaries. In Korean children, longer smartphone use was strongly associated with a symptom-plus-sign definition of DED, but the large effect estimate is vulnerable to residual environmental, socioeconomic, behavioral, and diagnostic confounding and cannot be transferred to adult esports [16]. Handheld viewing, outdoor activity, developmental stage, and symptom reporting differ from competitive desktop play.

Environmental and task factors should be considered together. A high monitor may increase the exposed ocular surface by widening the palpebral aperture, while low humidity or directed airflow may accelerate evaporation [12,22,23]. Glare or poor contrast may increase visual effort, and a close or poorly positioned display may alter accommodation, vergence, and posture [12,29]. These factors are plausible contributors, but the current esports literature provides no validated threshold for any single parameter. Clinicians should document modifiable extremes without claiming that one measurement explains all symptoms.

A practical risk assessment should combine task duration and uninterrupted bouts with viewing geometry, ambient conditions, optical correction, ocular history, and individual susceptibility. It should also establish when symptoms begin, whether they resolve between rounds or overnight, and whether they occur during comparable nondigital near work. This integrated history is more informative than a simple count of daily screen hours and avoids creating an unvalidated numerical risk score.

8. Clinical Implications

The main clinical implication is the need for disciplined classification. Symptoms, objective ocular findings, and formal DED should be reported as separate outcomes because concordance among them is generally weak [10,15]. A player may have troublesome burning and blur with normal tear testing, an abnormal tear measure without current symptoms, or both symptoms and signs compatible with DED. Each pattern requires a different interpretation.

Persistent screen-related complaints warrant a multifactorial history and examination rather than an explanation based on screen time alone [24]. Uncorrected refractive error, accommodative or vergence anomalies, ocular-surface disease, and environmental or ergonomic stressors may coexist. Contact-lens problems and other ocular or neurologic causes should be considered when warranted by the presentation. Screen use may reveal or aggravate a problem without being its sole cause.

The direct esports literature suggests a potential care gap. Only 2% of respondents in the collegiate survey reported seeking medical attention despite frequent health complaints [7]. The small sample prevents generalization but supports improving access to assessment rather than defining referral criteria.

Ocular care can be incorporated into a proposed multidisciplinary esports-health model that also addresses musculoskeletal health, mental health, physical activity, sleep, lifestyle, and ergonomics [9]. The model is conceptually useful because exposures and symptoms cluster, but its components have not been prospectively shown to improve outcomes. Integration should therefore mean coordinated assessment, not a claim of proven performance optimization.

Current evidence justifies attention to comfort and visual function but cannot quantify effects on reaction time, accuracy, match performance, or career longevity. Intermittent blur or discomfort could plausibly distract a player, but performance claims require studies that measure ocular variables and standardized gaming outcomes in the same protocol.

9. Prevention and Management

Management recommendations should reflect evidence certainty. A systematic review of 45 randomized trials found no computer vision syndrome intervention supported by high-certainty evidence [30]. Risk of bias, imprecision, heterogeneous populations, short follow-up, and inconsistent outcomes limit universal recommendations, especially for esports. Management should address identified refractive, ocular-surface, binocular, environmental, and workstation contributors [11].

9.1 Blue-light filters

In the broad intervention review, blue-blocking spectacles did not improve visual fatigue, and berry supplements did not improve outcomes for visual-fatigue or dry-eye symptoms [30]. On the studied outcomes and follow-up periods, neither intervention is an evidence-based treatment for gaming-related eye strain.

The focused Cochrane review identified a small, short-term, and heterogeneous evidence base for blue-light-filtering lenses. No trial had a low risk of bias across all domains, and the studies were too dissimilar for meta-analysis. Available randomized evidence did not support a meaningful reduction in short-term visual fatigue with blue-light-filtering spectacles [31]. Patients should not be told that such lenses are required to protect the eyes from ordinary gaming displays or to treat DES.

Blue light is not solely harmful. Short-wavelength light activates melanopsin-containing intrinsically photosensitive retinal ganglion cells and contributes to circadian entrainment. Findings on phototoxicity from unusually intense exposure, prolonged fixation, or in vitro and animal models should not be transferred directly to normal screen viewing. Under usual viewing conditions, emissions from common digital displays are described as remaining below published photobiological exposure limits [32,33]. The same narrative literature describes the evidence that blue-light-filtering lenses improve visual performance, relieve DES, or prevent retinal injury as limited or inconclusive, while the long-term effects of repeated low-level exposure remain incompletely defined [32,33]. This context is consistent with, but does not outweigh, the evidence from the systematic and Cochrane reviews [30,31].

9.2 Breaks and blink awareness

Regular breaks are reasonable because they interrupt sustained near demand and permit blinking and postural change, but the exact 20-20-20 schedule is a memorable option rather than a validated treatment dose [6,12,23]. Prompts may be placed between rounds, during matchmaking, or after a block of play, although team-level efficacy has not been established [23].

In a small uncontrolled sequential study of symptomatic laptop users, reminder software increased break frequency and shortened uninterrupted computer-use bouts. After two weeks, symptom scores were lower, but most measured ocular-surface and binocular outcomes did not improve, except for a small change in accommodative facility. The improvement in symptoms was not maintained one week after the reminders were discontinued [34]. Because the uncontrolled sequential design allows expectancy effects, regression to the mean, and unrelated temporal changes, the findings should be interpreted as a short-term symptom signal rather than proof that the 20-20-20 rule reverses objective ocular or binocular dysfunction [34]. The study also illustrates why symptom benefit, behavioral adherence, and objective improvement should be evaluated separately.

An online survey found that about 34% of respondents used the 20-20-20 practice regularly or occasionally, but overall symptom scores did not differ between users and nonusers [35]. Burning and headache were more frequent among users, which is compatible with symptom-driven adoption rather than harm or benefit from the rule [35].

Reminder design may affect user engagement. A small mixed-methods study used focus-group input and a 14-day deployment to examine interface elements in symptomatic computer users. Instruction, feedback, goal setting, popup size, and symptom-like visual cues showed mixed positive and negative associations with recorded participation [36]. The outcome was engagement with prompts, not symptom relief, improved tear-film measures, or esports performance [36]. These findings may inform interface design but do not establish clinical efficacy.

9.3 Artificial tears and supplements

When examination identifies ocular-surface involvement, lubrication may be considered as part of condition-specific management. Gaming exposure alone does not justify routine prophylactic use.

During a three-day gaming convention, adding preservative-free 0.15% hyaluronic-acid tears to scheduled ergophthalmological measures was associated with less short-term worsening of symptoms than the measures alone. The between-group difference was symptomatic; objective improvement of the ocular surface was not demonstrated [37]. The direct gaming exposure makes the result relevant, but the sample was small, predominantly male, and observed for only three days.

The trial was limited by incomplete adherence, uncontrolled environmental conditions and examination timing, manufacturer funding, and supported medical writing. It provides a sponsor-involved short-term signal, not evidence for routine prophylaxis or prevention of chronic ocular disease [37]. Clinician-directed lubrication for established abnormalities is different from universal use in healthy teams.

Omega-3 supplementation produced a low-certainty signal for improvement in dry-eye symptoms in two trials from one research group, with heterogeneity and gastrointestinal intolerance. This evidence does not support routine use for esports-related DES [30]. Nutritional interventions should be distinguished from correction of a documented deficiency and from established DED management. Marketing claims should not exceed the population studied or the certainty of the evidence.

10. Proposed Clinical Assessment Framework

The proposed clinical assessment framework should identify players who may benefit from a more comprehensive examination. It should begin with task-linked complaints such as burning, dryness, blurred vision, or headache and document when they appear, whether they resolve, and how they interfere with play or other near work. Its purpose is to organize a symptom-led assessment, not to certify that a player is free of visual disorders.

A structured symptom inventory such as the CVS-Q can provide a reproducible measure of this symptom pattern [14]. The score should remain a symptom measure. A positive threshold does not diagnose DED, accommodative dysfunction, convergence insufficiency, or an esports-specific disease.

The history should capture daily and uninterrupted gaming duration, practice and competition structure, contact-lens use, refractive correction, and the timing of external and internal symptoms. Workstation review should document monitor characteristics, viewing distance and height, glare, room lighting, and airflow [12,18]. Clinicians should ask whether symptoms occur during active play, passive review, other screen use, reading, or all near tasks. Improvement between rounds, after sleep, or away from screens can help establish temporality without proving causation.

When indicated by symptoms or history, examination may include distance and near visual acuity, current optical correction, ocular alignment and motility, convergence, accommodative amplitude or facility, and other targeted tests [17]. A small observational study illustrates the possible breadth of refraction, binocular, fusional, tear, and symptom assessment but is too limited to define a universal esports battery [27].

Ocular-surface assessment may include observation of the eyelids and blinking, tear-film stability, staining, and other tests appropriate to the clinical setting [1]. Findings should be interpreted alongside symptoms and the differential diagnosis. A short tear break-up time may be relevant, but it does not by itself establish DED or show that gaming caused the abnormality. Clinical assessment should lead to condition-specific management rather than repeated empirical use of screen filters [1]. Optical correction should match the task distance, and confirmed DED or binocular disorders should be managed within their respective clinical frameworks. Response to an intervention can be followed with the same symptom instrument and relevant objective measures while keeping subjective and objective outcomes separate.

The proposed clinical assessment framework comprises (1) a structured symptom inventory; (2) an acuity and optical-correction check; (3) a targeted ocular-surface and binocular

examination; (4) review of the workstation, environment, and uninterrupted task structure; and (5) follow-up after selected changes. Symptoms that persist, are not clearly linked to screen use, or are accompanied by clinically relevant examination findings warrant a comprehensive eye assessment. The urgency and referral pathway should be determined from the complete clinical presentation. This framework is a practical proposal rather than a validated esports assessment protocol because current studies are small and heterogeneous and do not report prospective diagnostic yield.

Follow-up should define success in advance and keep subjective and objective outcomes separate. Symptom improvement may be meaningful without normalization of tear-film or binocular measures, while an objective abnormality may require treatment or monitoring despite modest symptoms. Persistent symptoms, poor linkage to screen use, or clinically relevant findings warrant comprehensive eye assessment; urgency depends on the full presentation.

This review has several limitations. It used a focused narrative approach rather than a systematic review and did not apply a formal risk-of-bias tool. Only English-language publications from 2015 to 1 July 2026 were considered. Direct esports evidence was sparse and consisted mainly of small cross-sectional studies and short gaming experiments; consequently, part of the clinical interpretation relied on indirect evidence from occupational, pediatric, and general screen-user populations. Heterogeneous definitions, instruments, exposure measures, and outcomes prevented quantitative synthesis. The proposed clinical assessment framework should therefore be regarded as provisional and requires prospective validation in diverse esports cohorts.

11. Conclusions

Esports is a relevant setting for DES, but direct evidence primarily concerns acute symptoms, task-related blink suppression, and short-term or cross-sectional differences in selected near-vision measures; longitudinal cohorts are lacking. Symptoms, objective ocular signs, and formal DED must remain distinct, and acute or cross-sectional findings should not be presented as chronic injury caused by esports.

A symptom-led history followed by targeted assessment of ocular-surface, refractive, binocular, environmental, and ergonomic contributors is more defensible than a universal device-based remedy. The proposed clinical assessment framework is practical but requires validation. Individualized breaks, blink awareness, and ergonomic adjustments are reasonable

low-risk measures, whereas the exact 20-20-20 schedule and blue-light-filtering lenses should not be presented as proven treatments.

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All authors have read and agreed to the published version of the manuscript.

Funding:

This research received no external funding.

Institutional Review Board Statement:

Not applicable.

Informed Consent Statement:

Not applicable.

Data Availability Statement:

Not applicable.

Conflicts of Interest:

The authors declare no conflict of interest.

Declaration of generative AI and AI-assisted technologies in the writing process:

In preparing this work, the authors used ChatGPT for the purpose of language editing, improving readability, summarizing selected publications, and assisting with bibliographic. After using this tool, the authors reviewed and edited the content, verified the cited sources, and accepted full responsibility for the substantive content of the publication.

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