

Novice teachers' visual behaviour to students' performance in physical education classes: a mobile eye-tracking approach

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Abstract:

Introduction: The development of professional vision in Physical Education depends on the ability to selectively process pedagogically relevant visual information within dynamic and cognitively demanding environments. Despite the increasing use of mobile eye-tracking in sport and education, limited evidence exists on how novice Physical Education teachers allocate visual attention to students' motor performance and behavioural engagement in ecologically valid contexts. **Objective:** This study employed mobile eye-tracking to examine novice teachers' gaze behaviour in relation to students' motor competence and behavioural engagement. **Methodology:** Thirty novice Physical Education teachers undertaking a pedagogical internship observed an authentic video-recorded 9th-grade lesson while wearing Tobii Pro Glasses 3. Students' motor competence was determined via teacher ratings and off-task behaviour through a post-observation questionnaire. Fixation duration and fixation count were analysed as objective indicators of visual attention across closed (structured) and open (dynamic) motor tasks. **Results:** Significant negative correlations between gaze metrics and motor competence were observed in the closed task, but these relationships were not evident in the open task. Although participants demonstrated longer and more frequent fixations on on-task students, this attentional bias did not translate into accurate identification of off-task behaviour. **Discussion:** Findings indicate greater visual attention towards lower-performing students and suggest that increased task complexity and environmental dynamism constrain attentional allocation. Additionally, the low levels of accurate identification reveal a dissociation between visual attention and behavioural interpretation. **Conclusions:** These findings identify task complexity as a key moderating factor in visual attention and highlight limitations in novice teachers' perceptual-cognitive processing, supporting the use of mobile eye-tracking to inform targeted interventions for enhancing professional vision in Physical Education classes.

Key Words: Eye-tracking; learning; motor competence; off-task behaviour; teacher training; visual attention

Introduction

The professional development of Physical Education teachers is fundamentally anchored in the ability to perceive and interpret the multifaceted dynamics of the learning environment (Quevedo et al., 2014). For novice teachers, who are in a formative stage of refining their pedagogical skills, the capacity to notice critical incidents, such as students' motor performance or lapses in engagement, is essential for future instructional effectiveness (Barnhart et al., 2024).

This perceptual skill involves the selective attention to and interpretation of relevant events within the complex ecosystem of the classroom or sports hall. Building on the considerations outlined above, the objects of a teacher's attention in Physical Education are inherently dynamic (Stahnke & Blömeke, 2021). Within this setting, particular attention must be directed toward students' motor competence, specifically the coordination and control of movement execution, which constitutes a primary indicator of learning and skill acquisition (Lorås, 2020; Estevan et al., 2021).

Concurrently, teachers must manage student engagement, swiftly identifying off-task behaviour that can disrupt the learning process for others (Broad et al., 2023; Zulfqar et al., 2025). The simultaneous monitoring of

these elements constitutes a significant cognitive load, particularly for novices whose attentional resources are still developing (Daumiller et al., 2025).

Investigating how novice teachers distribute their visual focus offers a direct window into these cognitive processes. The extant literature suggests a disparity between expert and novice teachers, with experts exhibiting more efficient, targeted gaze patterns towards pedagogically relevant information, while novices display a more scattered attentional focus (Kosel et al., 2021).

It remains an open question, however, to what extent novice Physical Education teachers prioritise aspects of motor skill execution versus classroom management issues, such as off-task behaviour, when observing student performance (Gabel et al., 2025). Therefore, understanding these visual priorities is crucial, as the ability to focus on relevant pedagogical cues while filtering out distractions is a hallmark of effective teaching and is critical for fostering meaningful learning experiences (Wyss et al., 2023).

The perceptual skills of novice Physical Education teachers have begun to be explored more directly, like the use of eye-tracking technology to assess how different educational interventions affect the perception of “teaching affordances” (van Maarseveen et al., 2025). Another work highlights the value of using video-based scenarios and gaze analysis to understand how Physical Education pre-service teachers process visual information and make decisions (Mendes et al., 2026).

Video-based methodologies offer a controlled medium to examine how novice teachers observe and analyse classroom scenarios, providing a unique opportunity to dissect which aspects of student performance they prioritise when removed from the immediate pressures of instruction (Duvivier et al., 2024). Despite this progress, while eye-tracking research on teacher noticing has proliferated in traditional classroom settings (Stahnke & Blömeke, 2021), its application to the movement-rich discipline of Physical Education remains remarkably scarce.

A review of the literature confirms that studies specifically addressing novice teachers' visual attention to both motor competence and off-task behaviour in Physical Education are virtually non-existent (Mendes et al., 2025). This represents a critical methodological and contextual void, as the development of professional vision in Physical Education teachers must be investigated within the various environments where motor skills are practised and engagement fluctuates most dynamically.

To bridge this gap, this study employs mobile eye-tracking technology to analyse the visual behaviour of novice Physical Education teachers. Specifically, we investigated their gaze patterns while observing a video recording of an authentic 9th-grade Physical Education class. The study aimed to: i) analyse the association between novice teachers' visual behaviour and the observed students' motor competence levels during both closed and open skills; ii) compare the visual attention directed towards students exhibiting on-task versus off-task behaviour; and iii) examine the relationship between novice teachers' gaze patterns and their accuracy in identifying instances of off-task behaviour.

We hypothesise a statistically significant correlation between visual attention distribution and student performance, predicting increased fixation on students demonstrating both lower motor competence (Chaudhuri et al., 2022) and higher frequencies of off-task behaviour (Shinoda et al., 2021).

Material & methods

Participants

Thirty novice Physical Education teachers (16 female, 14 male; mean age = 24.90 years, standard deviation = ± 5.89) were recruited through purposive sampling from a Portuguese higher education institution. All participants were enrolled in a 2nd-year master's programme dedicated to professional training of Physical Education teachers for primary and secondary education levels.

Participants were immersed in their year-long pedagogical internship, a formative period through direct practical engagement (Chaudhuri et al., 2022) and selected randomly. The sample size is congruent with prior eye-tracking investigations within teacher education that have employed analogous methodological and statistical frameworks (Kosel et al., 2021; Mendes et al., 2026), furnishing a robust empirical foundation for the subsequent statistical analyses.

Ethical Considerations

The study was conducted in rigorous conformity with the ethical principles enshrined in the Declaration of Helsinki and the Oviedo Convention. Formal ethical clearance was prospectively obtained from the Ethics Committee of the Faculty of Sport Sciences and Physical Education, University of Coimbra (reference CE/FCDEF-UC/00142024). Written informed consent was duly secured from each individual, thereby ensuring adherence to the highest standards of research integrity and participant autonomy.

Instruments

Eye-tracker glasses

Novice teachers' visual behaviour within areas of interest (AOI) was captured using Tobii Pro Glasses 3 and subsequently processed and analysed with Tobii Pro Lab software (version 1.207). The Tobii Pro Glasses 3 perform binocular eye-tracking using four integrated eye cameras, allowing the reliable identification of fixation events, saccadic eye movements and attentional shifts during complex perceptual tasks (Tobii Pro, 2023).



Fig. 1. Wearable eye-tracking system, integrating binocular gaze tracking and a forward-facing scene camera for gaze mapping. Source: Authors' own elaboration.

The combination of high temporal resolution, spatial accuracy and scene-referenced gaze mapping (Fig.1) makes this system particularly suitable for investigating perceptual-cognitive processes (Tobii Pro, 2023) and visual attention allocation in Physical Education contexts.

Video camera

A high-definition digital video-camera, calibrated to record at a temporal resolution of 60 frames per second (Hirota et al., 2022), was deployed to capture two distinct motor practice tasks enacted during an authentic Physical Education class (Mendes et al., 2026).

Motor competence level assessment scale

To operationalise the measurement of motor competence among the 9th-grade students featured in the recorded didactic unit, a six-point Likert-type scale was employed. Anchored by the descriptors (1) "Very low performance" and (6) "Very high performance", this instrument afforded a granular evaluation of motor execution quality throughout the observed tasks (Holler & Schüller, 2024).

Off-task behaviour identification questionnaire

The identification of off-task behaviour was operationalised through a sequential two-phase procedure. Initially, participants posed a binary screening question: "Do you know which students displayed off-task behaviours?". Upon affirmative response, participants were presented with a photographic still of the 9th-grade class captured during task execution and instructed to identify the specific individuals they had perceived as disengaged ("Which ones?") (Yamamoto & Imai-Matsumura, 2013; Shinoda et al., 2021).

Procedure

First phase

The video-camera was deployed to capture a one-minute segment of an authentic 9th-grade Physical Education class (Mendes et al., 2026). Adhering to established methodological protocols for the acquisition of ecologically valid classroom interactions (Goldberg et al., 2021), the recording encompassed two distinct motor practice tasks drawn from a football didactic unit: i) a closed task (ball control circuit incorporating dribbling, passing and receiving); and ii) an open task (small-sided game: 4 vs 4). The selection of both the specific lesson and the broader didactic unit was undertaken in close consultation with the class's regular teacher.

Immediately subsequent to the recorded class, the class's regular teacher (a tenured educator possessing 36 years of professional service) was tasked with completing the *Motor competence assessment scale*, furnishing a systematic evaluation of each student's motor proficiency within the football didactic unit. For the purposes of this assessment, motor competence was conceptually delineated as the capacity to execute a diverse repertoire of motor tasks proficiently, encompassing fine and gross motor skill coordination, movement quality and postural control (Lorås, 2020; Estevan et al., 2021).

Second phase

Novice teachers viewed the instructional video once on a computer monitor with a resolution of 1920 × 1080 pixels while wearing the Tobii Pro Glasses 3 to record their visual behaviour (Kosel et al., 2021). Gaze data acquisition followed standardized eye-tracking procedures to ensure methodological reliability and measurement validity. Participants were seated approximately 60 cm from the monitor, with chair height adjusted to align the participants' eye level with the centre of the display. Subsequently, a calibration procedure using a fixation target was performed to align each participant's gaze vectors with the reference stimulus - a 3-second central fixation cross ("+") appeared before both video segments began (Shinoda et al., 2021).

Before viewing the video, participants received standardized instructions regarding the recorded Physical Education class. The briefing included contextual information about the instructional sequence (lesson number and pedagogical objective), as well as the main pedagogical components of the lesson (tasks presented, critical performance elements and success criteria expected from students) (Mendes et al., 2026).

The analytical focus was directed toward fixations (operationalised as epochs of relative ocular stability during which visual attention is allocated to a circumscribed spatial locus, typically enduring between 200 and 300 milliseconds). Three principal fixation metrics were derived for each participant: total fixation duration, mean fixation duration and fixation count (Holmqvist et al., 2015; Chaudhuri et al., 2022). Immediately subsequent to stimulus presentation, participants were furnished with a standardised conceptual delineation of off-task behaviour, operationalised as student conduct dissociated from and unrelated to the prevailing learning task (Ludyga et al., 2022; Broad et al., 2023).



Fig. 2. Novice teachers detected disengaged students using the *Off-task behaviour identification questionnaire*.
Source: Authors' own elaboration.

Thereafter, participants completed the *Off-task behaviour identification questionnaire* (Yamamoto & Imai-Matsumura, 2013; Shinoda et al., 2021). As depicted in Fig. 2, participants were initially presented with a binary screening query, followed (contingent upon an affirmative response) by a photographic identification task wherein they were instructed to pinpoint specific individuals perceived as manifesting off-task behaviour.

Variables

Independent variables

The independent variables comprised three conceptually distinct categories of student-level attributes: the manifest motor competence level, the incidence of off-task behaviour and the accuracy with which novice teachers identified students displaying off-task behaviour (Shinoda et al., 2021).

Dependent variables

The dependent variables encompassed the full complement of gaze metrics derived from novice teachers' oculomotor behaviour during stimulus observation. For each AOI corresponding to an individual 9th-grade student, the following parameters were quantified: fixation count (total number of discrete fixations directed toward each AOI), total fixation duration (cumulative dwell time on each AOI, in milliseconds) and mean fixation duration (average temporal extent of individual fixations, in milliseconds) (Chaudhuri et al., 2022).

Data analysis

For data analysis, discrete AOI were demarcated for each 9th-grade students featured in the video stimulus (designated AOI1 through AOI8). Using Tobii Pro Lab software (version 1.207), each AOI was delineated to extract fixation metrics specific to each individual student.

To examine the association between novice teachers' visual behaviour and the observed students' motor competence levels, Spearman's rank correlation coefficient (r) was employed. The same analytical approach was applied to assess the relationship between gaze patterns and the incidence of off-task behaviour, both within each of the two motor practice moments (closed and open tasks) and between participants' accuracy in identifying off-task students and their corresponding gaze metrics. Correlation strength was interpreted according to the conventions established by Tabachnick and Fidell (2021), wherein coefficients are classified as weak ($r < 0.3$), moderate ($0.3 \leq r < 0.5$) or strong ($r \geq 0.5$).

Differences in novice teachers' visual attention as a function of student motor competence levels were evaluated using a one-way ANOVA (Kroes & Finley, 2023). Effect sizes were computed using eta squared (η^2), with values interpreted in accordance with established conventions in educational research as weak ($\eta^2 < 0.06$), moderate ($0.06 \leq \eta^2 < 0.14$) or strong ($\eta^2 \geq 0.14$).

To compare gaze patterns between novice teachers who accurately identified off-task students and those who did not, independent samples T-test were conducted. This parametric approach was employed subsequent to verification of the underlying assumptions, including normality of distribution and homogeneity of variance (Pallant, 2020). The same analytical procedure was applied to examine differences in visual attention directed toward students exhibiting on-task versus off-task behaviour during both motor practice moments. Effect sizes for T-test comparisons were quantified using Cohen's d , with thresholds for interpretation defined as: weak ($d < 0.2$), moderate ($0.2 \leq d < 0.5$), strong ($0.5 \leq d < 0.8$) and very strong ($d \geq 0.8$).

All statistical procedures were executed using IBM SPSS Statistics (version 29), with the statistical significance established at $p = 0.05$ throughout all analyses.

Results

Visual behaviour and students' motor competence level

In Table 1 and Table 2, for the first motor practice task, all visual behaviour variables were significantly associated with motor competence level. Total fixation duration was negatively correlated with competence level ($r = -.340$, $p = .001$), indicating longer gaze allocation towards students with lower motor competence. The group comparison confirmed this pattern ($p = .001$), with significantly greater fixation duration for the “Sufficient” level compared with both “High” and “Very high” levels, and a strong effect size ($\eta^2 = .269$).

Average fixation duration also showed a significant inverse association with competence level ($r = -.241$, $p = .001$). The ANOVA revealed differences between competence groups ($p = .001$), with a moderate effect size ($\eta^2 = .066$). A similar trend was observed for the number of fixations, which was negatively correlated with competence level ($r = -.225$, $p = .001$). The comparison analysis likewise indicated differences between competence groups ($p = .001$), with a moderate effect magnitude ($\eta^2 = .096$). During task 1, students with lower motor competence received greater visual attention across all fixation metrics.

Table 1. Statistical correlation - Visual behaviour and Students' motor competence level (“Sufficient”, “High” and “Very high”).

Task	Visual behaviour	Sufficient	High	Very high	Correlation		
		Average SD	Average SD	Average SD	P value	R	ES
Task 1	Total fixation duration (ms)	4946.42 ± 2456.58	2215.03 ± 1250.61	2572.90 ± 1649.16	.001*	-.340	Moderate
	Average fixation duration (ms)	720.18 ± 359.34	509.17 ± 244.68	517.13 ± 364.56	.001*	-.241	Weak
	Number of fixations	7.18 ± 2.70	4.50 ± 2.53	5.37 ± 3.36	.001*	-.225	Weak
Task 2	Total fixation duration (ms)	1889.48 ± 1343.64	1545.63 ± 1403.23	1738.37 ± 1265.12	.839	-.013	Weak
	Average fixation duration (ms)	470.28 ± 259.17	341.95 ± 267.24	376.34 ± 222.62	.110	-.103	Weak
	Number of fixations	4.05 ± 2.59	4.30 ± 3.30	4.27 ± 2.68	.550	.039	Weak
Total	Total fixation duration (ms)	6835.90 ± 2991.11	3760.67 ± 1996.07	4311.27 ± 2352.04	.001*	-.279	Weak
	Average fixation duration (ms)	644.88 ± 284.06	424.67 ± 172.21	462.43 ± 184.78	.001*	-.226	Weak
	Number of fixations	11.23 ± 4.30	8.80 ± 4.15	9.63 ± 4.85	.083	-.112	Weak

*Significant correlation, $p < .05$.

In the second motor practice task, the relationship between gaze behaviour and motor competence level was markedly weaker. Neither total fixation duration nor number of fixations showed significant correlations with competence level ($p \geq .550$). The group comparisons for these variables were also non-significant ($p \geq .360$), with small effect sizes. For average fixation duration, the correlation with competence level was not significant ($r = -.103$, $p = .110$). The ANOVA indicated differences between competence levels ($p = .011$), specifically between the “Sufficient” level and the higher competence levels, although the effect size remained small ($\eta^2 = .037$). These findings suggest a more homogeneous distribution of visual attention across competence levels during task 2.

Table 2. Statistical comparison - Visual behaviour and Students' motor competence level (“Sufficient”, “High” and “Very high”).

Task	Visual behaviour	Sufficient	High	Very high	Comparison		
		Average SD	Average SD	Average SD	P value	N ²	ES
Task 1	Total fixation duration (ms)	4946.42 ± 2456.58	2215.03 ± 1250.61	2572.90 ± 1649.16	.001 ^{ab}	.269	Strong
	Average fixation duration (ms)	720.18 ± 359.34	509.17 ± 244.68	517.13 ± 364.56	.001 ^{ab}	.066	Moderate
	Number of fixations	7.18 ± 2.70	4.50 ± 2.53	5.37 ± 3.36	.001 ^{ab}	.096	Moderate
Task 2	Total fixation duration (ms)	1889.48 ± 1343.64	1545.63 ± 1403.23	1738.37 ± 1265.12	.360	.009	Weak
	Average fixation duration (ms)	470.28 ± 259.17	341.95 ± 267.24	376.34 ± 222.62	.011 ^{ab}	.037	Weak
	Number of fixations	4.05 ± 2.59	4.30 ± 3.30	4.27 ± 2.68	.862	.001	Weak
Total	Total fixation duration (ms)	6835.90 ± 2991.11	3760.67 ± 1996.07	4311.27 ± 2352.04	.001 ^{ab}	.194	Strong
	Average fixation duration (ms)	644.88 ± 284.06	424.67 ± 172.21	462.43 ± 184.78	.001 ^{ab}	.143	Strong
	Number of fixations	11.23 ± 4.30	8.80 ± 4.15	9.63 ± 4.85	.012 ^a	.037	Weak

^aSignificant differences between Sufficient and High levels, $p < .05$; ^bSignificant differences between

Sufficient and Very high levels, $p < .05$; ^cSignificant differences between High and Very high levels, $p < .05$.

When fixation metrics were aggregated across both tasks, the pattern observed in task 1 partially re-emerged. Total fixation duration was negatively correlated with competence level ($r = -.279$, $p = .001$). The

comparative analysis also revealed differences between competence groups ($p = .001$), with greater fixation durations directed towards students with Sufficient competence, and a strong effect size ($\eta^2 = .194$).

Average fixation duration showed a negative association with competence level ($r = -.226$, $p = .001$), with group differences confirmed by ANOVA ($p = .001$) and a strong effect size ($\eta^2 = .143$). The number of fixations did not correlate significantly with competence level ($r = -.112$, $p = .083$). The ANOVA detected group differences ($p = .012$), although the effect size was small ($\eta^2 = .037$). Taken together, the combined analysis indicates that lower motor competence levels were associated with greater gaze allocation, particularly when fixation duration metrics were considered.

Visual behaviour towards students' on-task and off-task behaviour

In Table 3, behavioural engagement was associated with differences in gaze allocation during the first task. Total fixation duration showed a positive correlation with engagement ($r = .208$, $p = .001$). The group comparison indicated longer fixation durations for on-task students compared with off-task students ($p = .001$), with a strong effect size ($d = -.592$). Average fixation duration also correlated positively with engagement ($r = .180$, $p = .005$). The comparison between behavioural conditions confirmed this difference ($p = .001$), with a moderate effect size ($d = -.470$). In contrast, the number of fixations was not significantly associated with behavioural engagement ($p \geq .105$), and the comparison between conditions was likewise non-significant.

Table 3. Statistical correlation and comparison - Visual behaviour and Students' behaviour ("Off-task" and "On-task").

Task	Visual behaviour	Off-task	On-task	Correlation			Comparison		
		Average SD	Average SD	P value	R	ES	P value	D	ES
Task 1	Total fixation duration (ms)	2006.13 ± 1150.21	3229.77 ± 2164.38	.001*	.208	Weak	.001 ^a	-.592	Strong
	Average fixation duration (ms)	424.50 ± 123.53	586.10 ± 364.35	.005*	.180	Weak	.001 ^a	-.470	Moderate
	Number of fixations	5.03 ± 3.38	5.69 ± 3.13	.105	.105	Weak	.291	-.207	Moderate
Task 2	Total fixation duration (ms)	1676.87 ± 1079.81	1735.26 ± 1353.40	.931	-.006	Weak	.821	-.044	Weak
	Average fixation duration (ms)	452.57 ± 220.31	382.47 ± 250.22	.035*	-.136	Weak	.147	.284	Moderate
	Number of fixations	3.70 ± 2.14	4.30 ± 2.90	.383	.057	Weak	.181	-.211	Moderate

*Significant correlation, $p < .05$; ^aSignificant differences, $p < .05$.

For the second motor practice task, the association between gaze behaviour and behavioural engagement was less evident. Total fixation duration was not correlated with engagement ($r = -.006$, $p = .931$), and the comparison between behavioural conditions was non-significant ($p = .821$). Average fixation duration showed a weak negative correlation with engagement ($r = -.136$, $p = .035$). The group comparison did not reveal significant differences ($p = .147$), despite a moderate effect size.

The number of fixations was not significantly associated with behavioural engagement ($r = .057$, $p = .383$), and the comparison between conditions was non-significant ($p = .181$). Overall, the results indicate limited associations between gaze behaviour and behavioural engagement during task 2.

Visual behaviour patterns and off-task behaviour identification

Questionnaire responses revealed a discrepancy between perceived awareness and actual identification accuracy. While many participants reported noticing off-task behaviour, the proportion of correct identifications was considerably lower, particularly during the second task (Fig. 3).

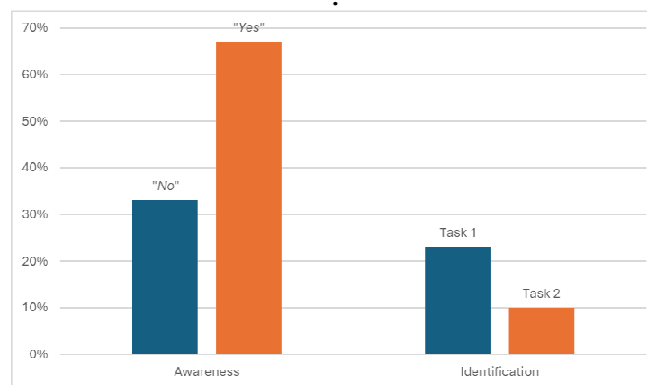


Fig. 3. Self-reported awareness and real-identification of off-task behaviour in each motor practice task
Source: Off-task behaviour identification questionnaire

In Table 4, no meaningful associations were observed between gaze behaviour and the identification of off-task behaviour. In task 1, correlations between gaze variables and identification performance were weak and non-significant (all $p \geq .516$). Similarly, comparisons between participants who reported identifying off-task students and those who did not revealed no significant differences across fixation metrics (all $p \geq .705$).

Table 4. Statistical correlation and comparison - Visual behaviour and Off-task behaviour identification (“No” and “Yes”).

Task	Visual behaviour	“No”	“Yes”	Correlation			Comparison		
		Average SD	Average SD	P value	R	ES	P value	D	ES
Task 1	Total fixation duration (ms)	3052.74 ± 2132.65	3187.09 ± 1979.96	.516	.042	Weak	.705	-.064	Weak
	Average fixation duration (ms)	567.38 ± 369.63	559.16 ± 223.21	.581	.036	Weak	.889	.024	Weak
	Number of fixations	5.57 ± 3.22	5.74 ± 2.90	.519	.042	Weak	.749	-.054	Weak
Task 2	Total fixation duration (ms)	1693.79 ± 1278.73	1884.51 ± 1503.59	.621	.032	Weak	.392	-.144	Weak
	Average fixation duration (ms)	391.26 ± 255.63	391.09 ± 207.80	.659	.029	Weak	.997	.001	Weak
	Number of fixations	4.16 ± 2.79	4.49 ± 2.95	.491	.045	Weak	.493	-.116	Weak
Total	Total fixation duration (ms)	4746.53 ± 2719.20	5071.60 ± 2718.76	.482	.046	Weak	.478	-.120	Weak
	Average fixation duration (ms)	500.56 ± 242.58	489.63 ± 138.42	.515	.042	Weak	.689	.048	Weak
	Number of fixations	9.74 ± 4.61	10.23 ± 4.67	.509	.043	Weak	.524	-.107	Weak

*Significant correlation, $p < .05$; ^aSignificant differences, $p < .05$.

A comparable pattern emerged in task 2, where correlations remained weak and non-significant (all $p \geq .491$), and group comparisons also showed no statistically significant differences (all $p \geq .392$). When fixation metrics were aggregated across both tasks, the same tendency persisted: none of the visual behaviour variables was significantly associated with off-task behaviour identification and effect sizes were negligible.

Discussion

Visual attention patterns varied according to both the structural characteristics of the task and the performance attributes of the observed students. These results provide insights into the perceptual strategies employed by novice teachers and address a critical gap in the literature examining professional vision in Physical Education contexts (Mendes et al., 2025).

Furthermore, a central finding of the study concerns the relationship between gaze behaviour and students’ motor competence during the structured task. The negative correlations observed between fixation metrics and performance levels suggest that participants allocated greater visual attention to students demonstrating lower motor competence (Chaudhuri et al., 2022).

This pattern indicates that novice observers may be particularly sensitive to salient deviations in movement execution. Similar tendencies have been reported in eye-tracking investigation conducted in traditional classroom environment, where teachers frequently direct visual attention towards learners displaying errors or learning difficulties (Kosel et al., 2021).

Within the theoretical framework of professional vision, such behaviour may reflect the early development of perceptual sensitivity to diagnostically relevant instructional cues (Stahnke & Blömeke, 2021). Nevertheless, the relatively modest magnitude of the correlations suggests that this capability remains only partially developed among novice teachers. In contrast, experienced educators typically demonstrate more efficient gaze strategies that allow them to distribute visual attention across multiple classroom events while maintaining sensitivity to pedagogically relevant information (Wyss et al., 2023).

No significant association between gaze behaviour and motor competence was observed during the open task involving a small-sided game. This difference highlights the influence of contextual complexity on perceptual processing. Open sport situations require observers to simultaneously monitor multiple moving players, ball trajectories and spatial interactions, thereby substantially increasing perceptual and cognitive load (Kosel et al., 2021).

Under these conditions, novice teachers may experience difficulties maintaining focused observation of individual students’ technical performance. Previous eye-tracking research has shown that complex classroom scenarios often produce more dispersed gaze patterns among inexperienced teachers, reflecting limitations in prioritising relevant visual information. The present findings extend this evidence to Physical Education environments, where the dynamic and interactive nature of sport activities further intensifies perceptual demands (Kosel et al., 2023).

The analysis of behavioural engagement provides additional insight into the observational strategies of novice teachers (Gabel et al., 2023). Participants exhibited longer fixation durations on students displaying on-task behaviour during the structured activity, indicating that visually engaged students attracted greater attentional resources. Research on teacher noticing consistently emphasises that professional vision involves both perceptual awareness and interpretative competence (Stahnke & Friesen, 2023).

Empirical comparison between novice and experienced teachers further show that beginners frequently observe salient classroom events but struggle to integrate contextual information into meaningful pedagogical judgements (Shinoda et al., 2021). The present results therefore reinforce the conceptual distinction between visual attention and pedagogical interpretation in Physical Education settings.

The discrepancy between gaze allocation and behavioural identification may also reflect attentional priorities characteristic of novice observers. Novice teachers often focus on visually salient or highly active students, while less conspicuous behavioural cues may remain undetected. Similar patterns indicate that novice teachers tend to prioritise overt engagement signals while monitoring the broader classroom context less systematically (Goldberg et al., 2021).

Experienced teachers typically display a more distributed visual attention pattern and are able to monitor multiple students and events concurrently (Murtonen et al., 2023). Consistent with these findings, the gaze behaviour observed in the present study appears to be primarily driven by bottom-up visual salience rather than by established pedagogical schemas.

Given the above, integrating eye-tracking technology into teacher education programmes represents a promising application of engineering innovation in educational practice (Telgmann & Müller, 2023). The capacity to record and analyse visual attention during the observation of sport activities provides a data-driven basis for designing perceptual training methodologies and may contribute to improve instructional effectiveness in Physical Education contexts (Mendes et al., 2026).

Conclusions

The findings demonstrate that visual attention patterns were influenced by the structural characteristics of the observed task. In the structured closed-skill activity, novice teachers allocated greater visual attention to students with lower levels of motor competence, suggesting that what the novice observers tend to prioritise are salient movement deviations.

However, this relationship was not observed in the open-task involving a small-sided game. The absence of such an association in the more dynamic activity highlights the influence of contextual complexity, as open sport situations require the simultaneous monitoring of multiple players and interactions, thereby increasing perceptual and cognitive demands.

A further finding concerns the relationship between gaze allocation and behavioural monitoring. Although participants devoted longer visual fixations to students displaying on-task behaviour, their ability to correctly identify off-task behaviour remained limited. This discrepancy suggests that visual attention alone is insufficient for accurate classroom interpretation and emphasises the need to develop perceptual-interpretative skills within Physical Education teacher education.

The characteristics of the participant group also provide important context for interpreting the results. As the study involved 2nd-year novice Physical Education teachers, the observed gaze patterns likely reflect early-stage perceptual strategies rather than consolidated professional vision. At this stage of professional development, pedagogical schemas and observational expertise remain under development, which may explain the limited efficiency observed in behavioural detection and attentional allocation.

Lastly, the results provide new insights into how novice Physical Education teachers visually monitor student performance and behaviour during the classes. By identifying task complexity as a key factor influencing perceptual behaviour, the study highlights the importance of targeted training approaches aimed at developing observational expertise and professional vision among future Physical Education teachers.

Limitations and Future Research

Larger samples and longitudinal designs would also contribute to a more comprehensive understanding of how professional vision develops throughout Physical Education teacher education. Future research should investigate visual attention behaviour across different stages of professional development, in order to examine how perceptual expertise evolves with teaching experience.

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