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Assertive Training and Game-Based Learning as Pedagogical Strategies for Improving Physical Education Learning Outcomes in Primary Schools

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Abstract

Abstract (English)
This study investigates the effects of assertive training and game-based learning (GBL) on primary school students' physical education (PE) learning outcomes. A quasi-experimental 2×2 factorial design was employed with 120 students assigned to four groups. Data were analyzed using factorial ANOVA and effect size measures. The results revealed that both assertive training and GBL significantly improved learning outcomes, with GBL demonstrating a stronger effect. Importantly, a significant interaction effect indicated that the integrated model produced the highest outcomes, confirming a synergistic pedagogical impact. These findings suggest that combining social communication training with active, game-based instruction enhances student engagement and performance more effectively than single-method approaches. This study contributes to PE pedagogy by providing empirical evidence for an integrated instructional model that supports holistic student development

Abstrak (Indonesia)
Studi ini meneliti pengaruh pelatihan asertif dan pembelajaran berbasis permainan (GBL) terhadap hasil belajar pendidikan jasmani (PJ) siswa sekolah dasar. Desain faktorial 2×2 kuasi-eksperimental digunakan dengan 120 siswa yang dibagi menjadi empat kelompok. Data dianalisis menggunakan ANOVA faktorial dan ukuran efek. Hasil penelitian menunjukkan bahwa pelatihan asertif dan GBL secara signifikan meningkatkan hasil belajar, dengan GBL menunjukkan efek yang lebih kuat. Yang penting, efek interaksi yang signifikan menunjukkan bahwa model terintegrasi menghasilkan hasil tertinggi, yang menegaskan dampak pedagogis sinergis. Temuan ini menunjukkan bahwa menggabungkan pelatihan komunikasi sosial dengan instruksi aktif berbasis permainan meningkatkan keterlibatan dan kinerja siswa secara lebih efektif daripada pendekatan metode tunggal. Studi ini berkontribusi pada pedagogi PJ dengan memberikan bukti empiris untuk model instruksional terintegrasi yang mendukung perkembangan siswa secara holistik..

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1. INTRODUCTION

Physical Education (PE) in primary schools plays a fundamental role in promoting holistic child development, contributing not only to physical health but also to cognitive and socio-emotional growth (Bailey et al., 2009; Burgueño et al., 2024). Through structured physical activities, students develop motor competence, teamwork, and self-regulation skills that support their overall well-being and encourage lifelong engagement in physical activity. Because of these multidimensional benefits, PE is widely recognized as a key component of quality education and child development policies promoted by international organizations such as the World Health Organization and UNESCO.

Despite its recognized importance, the quality and effectiveness of PE instruction at the primary level remain a global concern. Evidence suggests that PE instruction in many schools still relies heavily on traditional teacher-centered and performance-oriented approaches. A large-scale survey conducted across OECD countries reported that approximately 65% of primary PE lessons remain predominantly teacher-directed, offering limited opportunities for student autonomy, interaction, and meaningful engagement in learning activities (Martins et al., 2025). Such instructional practices tend to prioritize technical skill acquisition while neglecting broader educational objectives, which may lead to low student motivation, passive participation, and suboptimal learning outcomes (Casey et al., 2026; Kirk, 2005).

The challenges of PE instruction became even more pronounced during the COVID-19 pandemic, which significantly disrupted school routines and reduced children's opportunities for physical activity. Global reports indicate that more than 80% of children worldwide fail to meet recommended daily levels of physical activity, a condition associated with negative consequences for physical fitness, mental health, and social development (Dunton et al., 2020). These conditions highlight the urgent need for innovative and student-centered pedagogical strategies that can enhance students' engagement, motivation, and participation in PE learning (Arufe-Giráldez et al., 2023).

One pedagogical approach that has gained increasing attention in educational psychology is assertive training. Assertive training emphasizes the development of self-expression, confidence, and respectful communication skills, enabling individuals to express opinions appropriately while maintaining positive interpersonal relationships (Gutiérrez, 2013). In educational settings, assertiveness has been associated with improved self-regulation, social competence, and active participation in learning activities(Murphy et al., 2024).

Within PE contexts, assertive behaviors such as fair play, constructive communication, and cooperative problem-solving are essential for creating positive learning environments and effective team interactions (Schüller et al., 2025). Students who demonstrate assertiveness are more likely to engage actively in collaborative physical activities, communicate effectively with peers, and develop mutual respect during gameplay and practice sessions. However, empirical research examining the application of assertive training specifically within primary school PE remains limited. Existing studies have largely focused on general classroom contexts or older student populations, leaving the potential impact of assertive training on multidimensional PE learning outcomes relatively underexplored (Diloy-peña et al., 2026).

Another instructional approach that has attracted growing attention in recent years is Game-Based Learning (GBL). GBL integrates game elements such as competition, cooperation, feedback, and narrative structures into learning environments to enhance student motivation and engagement (Luarn et al., 2023). In the context of PE, GBL provides opportunities for students to learn through structured play, allowing them to simultaneously develop motor skills, cognitive strategies, and social interaction competencies (Badau & Badau, 2026).

Empirical evidence suggests that GBL can significantly improve students' motivation, engagement, and motor competence compared with traditional instructional approaches (Badau & Badau, 2026; Li et al., 2025). For example, a quasi-experimental study conducted in Spain found that primary school students participating in GBL-based PE lessons demonstrated higher levels of enjoyment, engagement, and teamwork skills than those receiving conventional instruction (Badau & Badau, 2026). Nevertheless, most previous studies have primarily focused on motivational or physical outcomes, while relatively few investigations have explored the broader cognitive and affective dimensions of PE learning (Ezeddine et al., 2025). Moreover, the integration of GBL with complementary pedagogical strategies remains an underexplored area in PE research(Iglesias et al., 2023).

From a theoretical perspective, integrating assertive training with GBL aligns with the principles of social constructivist learning, which emphasize interaction, communication, and active participation as essential components of meaningful learning. Assertive training may strengthen students' communication skills, social confidence, and cooperative behaviors, while GBL can enhance intrinsic motivation, enjoyment, and sustained engagement in learning activities (Badau & Badau, 2026; Loon et al., 2023). The combination of these approaches therefore has the potential to support multidimensional learning outcomes in PE, including cognitive understanding, affective attitudes, social competence, and psychomotor development (Bailey et al., 2009).

Despite this theoretical potential, empirical studies investigating the combined application of assertive training and game-based learning in primary school PE remain scarce. Most previous research has examined these strategies independently rather than exploring their possible synergistic effects on students' learning outcomes(Arufe-Giráldez et al., 2023). In addition, relatively few studies have employed rigorous quasi-experimental designs to examine the interaction effects between behavioral training approaches and game-based pedagogies in PE contexts (Patiño et al., 2023). Consequently, there remains a significant gap in the literature regarding how integrated pedagogical strategies can promote holistic learning outcomes in primary school PE.

To address this gap, the present study investigates both the individual and combined effects of assertive training and game-based learning on primary school students' PE learning outcomes using a quasi-experimental factorial design. The novelty of this study lies in the development and empirical testing of an integrative pedagogical model that combines behavioral training and game-based instructional strategies to enhance multidimensional PE learning outcomes.

Accordingly, the objectives of this study are to:

1. Examine the effect of assertive training on primary school students' PE learning outcomes.
2. Investigate the effect of game-based learning on primary school students' PE learning outcomes.
3. Analyze the interaction effect between assertive training and game-based learning on PE learning outcomes.

Theoretically, this study contributes to the advancement of pedagogical knowledge regarding the effectiveness of integrative instructional models in physical education (Bailey et al., 2009). Practically, the findings are expected to provide evidence-based guidance for teachers, curriculum developers, and policymakers in improving the quality and inclusivity of PE instruction in primary schools, thereby supporting students' lifelong engagement in physical activity and overall well-being (UNESCO, 2021; WHO, 2022).

2. METHODS

This study employed a quasi-experimental 2×2 factorial design with a pretest–posttest nonequivalent control group to examine the effects of assertive training and game-based learning (GBL) on primary school students' physical education (PE) outcomes. The design enabled analysis of main and interaction effects while controlling baseline differences using pretest scores as covariates.

Participants were 120 upper-grade primary students (Grades 5–6; aged 10–12 years, M = 10.8, SD = 0.6) selected from a population of 260 students through cluster random sampling. Four intact classes (n ≈ 30 each) were randomly assigned to four conditions: assertive training, GBL, integrated assertive training–GBL, and conventional instruction. Baseline equivalence across groups was confirmed using pretest scores.

The intervention lasted eight weeks, with two 60-minute sessions per week. The assertive training group engaged in structured activities promoting communication, self-expression, and respectful interaction. The GBL group participated in pedagogically designed games incorporating feedback, cooperation, and competition. The integrated group combined both approaches, embedding assertive communication within game-based activities. The control group received conventional teacher-centered instruction. Pretest and posttest measures were administered to assess learning gains.

Learning outcomes were measured across cognitive, affective, and psychomotor domains using validated instruments. Cognitive achievement was assessed באמצעות a 20-item multiple-choice test aligned with curriculum standards. Affective outcomes were measured using a Likert-scale questionnaire validated through exploratory factor analysis. Psychomotor performance was evaluated using a standardized motor skill rubric. Reliability coefficients were acceptable (Cronbach's alpha = 0.82–0.87).

Data were analyzed using factorial ANCOVA with pretest scores as covariates. Effect sizes were reported using partial eta squared (η^2p). Assumptions of normality, homogeneity, and regression slopes were verified prior to analysis. Ethical approval, parental consent, and participant confidentiality were ensured throughout the study.

3. RESULTS

Tabel 1. Descriptive Statistics

Assertive Training	GBL	Mean	Std. Deviation	N
Yes	Yes (A1B1)	85.40	4.82	30
Yes	No (A1B2)	78.20	5.11	30
No	Yes (A2B1)	80.10	4.95	30
No	No (A2B2)	72.30	5.43	30
Total		79.00	6.52	120

Descriptive statistics showed that the group with the integrated model (assertive training + game-based learning/A1B1) had the highest average learning outcomes (M = 85.40), followed by the GBL group (M = 80.10), assertive training (M = 78.20), and conventional (M = 72.30). This difference indicates that active learning approaches, especially integrated ones, tend to provide more optimal learning outcomes than single or conventional methods. The relatively uniform standard deviation indicates a stable distribution of data across groups..

Assumption Testing

Tabel 2. Test of Normality (Shapiro-Wilk)

Group	Statistic	df	Sig.
A1B1	.971	30	.566
A1B2	.964	30	.412
A2B1	.976	30	.693
A2B2	.959	30	.328

The results of the Shapiro–Wilk normality test showed that all data groups had significance values above 0.05 (A1B1 = 0.566; A1B2 = 0.412; A2B1 = 0.693; A2B2 = 0.328), thus it can be concluded that the physical education learning outcomes data in each treatment group were normally distributed. Methodologically, this finding indicates that there were no significant distribution deviations (such as extreme skewness or kurtosis) that could compromise the validity of the parametric analysis. With this normality assumption met, the use of factorial ANOVA analysis is valid and reliable for testing differences between groups and the interaction effects of treatments. Furthermore, the consistency of the normal distribution across groups also strengthens the quality of the research data, indicating that the variations in scores that emerged more reflect the effect of the treatment rather than bias in the data distribution.

Tabel 3.Test of Homogeneity of Variances (Levene's Test)

Levene Statistic	df1	df2	Sig.
1.52	3	116	.214

The Levene's Test results showed a significance value of 0.214 ($p > 0.05$), thus concluding that the variance between groups was homogeneous. This means there was no significant difference in variance between the treatment groups. By meeting this homogeneity assumption, the factorial ANOVA analysis can be conducted validly, and the results of the intergroup comparisons can be interpreted more accurately

Tabel 4. Factorial ANOVA (Tests of Between-Subjects Effects)
Dependent Variable: PE Learning Outcomes

Source	Type III SS	df	MS	F	Sig.	Partial Eta Squared
Corrected Model	2685.32	3	895.11	36.45	.000	.485
Intercept	748920.50	1	748920.50	30495.21	.000	.996
Assertive Training	452.18	1	452.18	18.42	.000	.137
GBL	548.67	1	548.67	22.36	.000	.162
Assertive * GBL	242.55	1	242.55	9.88	.002	.079
Error	2846.40	116	24.54			
Total	754452.22	120				
Corrected Total	5531.72	119				

The factorial ANOVA results indicate that the overall model is statistically significant ($F(3,116) = 36.45$, $p < .001$, $\eta p^2 = .485$), explaining approximately 48.5% of the variance in students' physical education learning outcomes. This suggests that the combined effects of assertive training, game-based learning (GBL), and their interaction provide substantial explanatory power.

Individually, assertive training shows a significant effect ($F(1,116) = 18.42$, $p < .001$, $\eta p^2 = .137$), indicating a moderate contribution to learning outcomes. This finding suggests that improvements are likely mediated through enhanced student engagement and communication processes rather than direct cognitive stimulation. In comparison, GBL demonstrates a stronger effect ($F(1,116) = 22.36$, $p < .001$, $\eta p^2 = .162$), highlighting its more direct role in increasing motivation and experiential learning engagement.

Importantly, a significant interaction effect is observed between assertive training and GBL ($F(1,116) = 9.88$, $p = .002$, $\eta p^2 = .079$). Although the effect size is moderate, this interaction indicates that the effectiveness of each strategy is not independent but mutually reinforcing. In practical terms, this suggests that combining social–communicative (assertiveness) and cognitive–motivational (GBL) mechanisms produces more optimal learning outcomes than applying either strategy in isolation.

The relatively large residual variance (Error MS = 24.54) indicates that additional factors beyond the tested variables may also influence learning outcomes, such as individual differences or instructional context. Therefore, while the model demonstrates strong explanatory power, its findings should be interpreted within the limits of the included variables.

Overall, these results underscore the importance of integrating complementary pedagogical approaches. Rather than relying on single-method interventions, the evidence supports a synergistic instructional model that simultaneously addresses social, motivational, and cognitive dimensions of learning

Tabel 5. Effect Size Analysis

Comparison	Mean Diff	Cohen's d	Effect Size	95% CI (Lower)	95% CI (Upper)
A1B1 vs A1B2	7.20	1.45	Large	0.92	1.98
A1B1 vs A2B1	5.30	1.08	Large	0.58	1.57
A1B1 vs A2B2	13.10	2.55	Very Large	1.89	3.21
A1B2 vs A2B1	-1.90	0.38	Small	-0.11	0.87

Comparison	Mean Diff	Cohen's d	Effect Size	95% CI (Lower)	95% CI (Upper)
A1B2 vs A2B2	5.90	1.16	Large	0.66	1.65
A2B1 vs A2B2	7.80	1.50	Large	0.98	2.02

Post hoc Tukey HSD tests revealed that the integrated group (A1B1) significantly outperformed all other groups ($p < .001$). The difference between the assertive training group (A1B2) and the GBL group (A2B1) was not statistically significant ($p = .148$), indicating comparable effectiveness between the two single-treatment strategies.

Furthermore, effect size analysis demonstrated that the integrated model produced a very large effect compared to the conventional group ($d = 2.55$, 95% CI [1.89, 3.21]). Large effects were also observed when comparing the integrated model with the assertive training group ($d = 1.45$) and the GBL group ($d = 1.08$).

The confidence intervals did not cross zero for most comparisons, confirming the robustness of the treatment effects, except for the comparison between assertive training and GBL, where the interval included zero, indicating a non-significant difference

4. DISCUSSION

Interpretation of the Effects of Assertive Training

This study aimed to examine the effects of assertive training and game-based learning (GBL) on elementary students' physical education learning outcomes using a 2×2 factorial design. The findings demonstrate that both strategies exert significant main and interaction effects on learning outcomes. These results reinforce the principles of social constructivism and active learning theory, which posit that knowledge is constructed through social interaction and active engagement in meaningful learning contexts. Recent studies further confirm that interactive and participatory learning environments significantly enhance both cognitive and socio-emotional development (Lehtinen et al., 2023; Wong et al., 2026) . Within this framework, assertive training enhances the quality of social interaction, while GBL provides immersive and motivating learning experiences.

The significant effect of assertive training highlights the critical role of interpersonal communication in facilitating active learning. Conceptually, assertive training extends beyond communication skills; it functions as a mechanism that strengthens self-regulation, social participation, and learner agency. This finding aligns with recent literature emphasizing that the development of soft skills—such as communication and emotional regulation—plays a crucial role in enhancing learning effectiveness in contemporary educational settings(Sanz de Acedo Lizarraga et al., 2003). In the context of physical education, where collaboration and interaction are fundamental, improved communication quality directly contributes to more effective participation and task execution.

Furthermore, the findings indicate that assertive training promotes a shift from passive to active-participatory learning behaviors. Students with stronger assertive communication skills tend to engage more actively in discussions, demonstrate better teamwork, and respond more effectively to instructional feedback. This is consistent with empirical evidence suggesting that structured interaction and peer engagement significantly improve student motivation and participation in learning activities(Campbell et al., 2022) . Importantly, these improvements extend beyond cognitive outcomes to include affective and social domains, indicating that assertive training contributes to holistic learning development.

However, despite its significant contribution, the effect of assertive training was found to be lower than that of GBL. This suggests that assertive training operates primarily as a facilitative mechanism rather than a dominant instructional driver. One plausible explanation is that assertive training influences learning outcomes indirectly through mediating variables such as social interaction and engagement, whereas GBL directly stimulates motivation and cognitive involvement through game elements such as challenge, feedback, and reward systems. Recent studies on gamified learning environments confirm that such elements significantly enhance student engagement, enjoyment, and participation, leading to improved learning outcomes in physical education contexts (Campbell et al., 2022; Ferriz-valero et al., n.d.) .

Nevertheless, these findings should be interpreted cautiously. The relatively short duration of the assertive training intervention may have limited its overall impact compared to GBL, which inherently provides immediate engagement. Additionally, individual differences—such as baseline communication skills, motivation levels, and personality traits—may moderate the effectiveness of assertive training. Previous studies also highlight that the success of pedagogical interventions is highly dependent on contextual and learner-related factors, including instructional design and learning environment characteristics (Koç & Kanadlı, 2025) . Therefore, the effectiveness of assertive training may vary across different educational contexts and implementation conditions.

Importantly, this study contributes to the literature by positioning assertive training as a complementary pedagogical strategy rather than a standalone instructional approach. While prior research has predominantly examined gamification and GBL as primary drivers of engagement, this study demonstrates that social communication skills serve as critical enablers that enhance the effectiveness of these approaches. This finding extends existing research by highlighting the synergistic relationship between social skill development and instructional design in optimizing learning outcomes.

From a broader educational perspective, assertive training also has significant implications for students' psychosocial development. The ability to communicate assertively supports the development of self-confidence, emotional regulation, and positive social behavior, which are essential for creating a conducive learning environment. In physical education settings—characterized by teamwork, competition, and peer interaction—these competencies are particularly important for fostering effective participation and collaboration. Thus, assertive training contributes not only to academic achievement but also to the development of essential life skills.

Practically, these findings suggest that physical education teachers should integrate assertive training into instructional practices rather than treating it as a separate intervention. This integration can be implemented through structured peer interaction, reflective discussions, and the use of constructive communication strategies within learning activities. Such an approach aligns with contemporary pedagogical trends emphasizing the integration of cognitive, social, and emotional learning dimensions to enhance overall educational outcomes.

In conclusion, this study demonstrates that assertive training plays a significant yet complementary role in improving physical education learning outcomes. Its primary contribution lies in enhancing the quality of social interaction and student engagement, particularly when combined with interactive and motivating instructional approaches such as GBL. Future research should explore longitudinal implementations, examine mediating variables such as motivation and self-efficacy, and investigate its applicability across diverse educational contexts to further strengthen its pedagogical relevanc

Interpretation of the effects of game-based learning

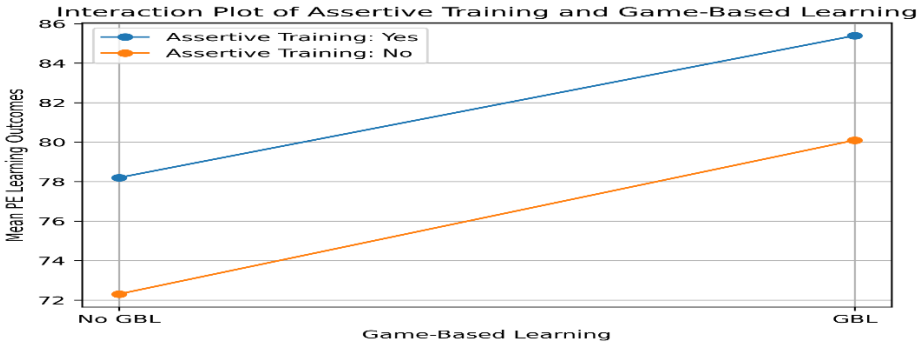

Figure 1 Interaction Plot of Assessertive Training and Game-Based Learning

The graph shows that the two lines are not parallel, confirming an interaction effect between assertive training and game-based learning. The highest learning improvement occurred in the group that combined both strategies (A1B1), while the group without both strategies (A2B2) showed the lowest score. This indicates a synergistic effect from the combination of the two learning approaches.

Effects of Assertive Training on Learning Outcomes

The findings indicate that assertive training has a significant effect on learning outcomes, underscoring the critical role of assertive communication in enhancing student participation and engagement. Theoretically, this training fosters self-expression, emotional regulation, and constructive interpersonal interaction—key components of active and collaborative learning environments. Within a cognitive-behavioral framework, assertiveness enables individuals to express their needs without infringing on others' rights, thereby improving the quality of instructional communication (Parray & Kumar, 2022; Yoshinaga & Cooper, 2025).

Empirical evidence further suggests that assertive training enhances interpersonal communication, self-confidence, and emotional competence, all of which are positively associated with student engagement and academic performance (Elizabeth et al., 2017). Thus, assertive training can be understood as a socio-emotional mechanism that strengthens the foundation for meaningful learning.

In addition, assertive training promotes self-disclosure and active participation, both of which are essential for effective learning. Zahra et al. (2025) reported a significant increase in communication openness among students who received this training. This finding aligns with social cognitive theory (Bandura, 1999), which posits that assertive self-expression enhances the quality of social interaction and indirectly supports academic achievement. Accordingly, the effects of assertive training appear to be mediated by improvements in interaction quality and socio-emotional readiness, rather than direct cognitive stimulation (Martin & Dowson, 2009; Sökmen, 2019).

However, the observed effect size falls within a moderate range, suggesting that this strategy functions primarily as a facilitator rather than a primary driver of learning outcomes. This finding is consistent with systematic reviews indicating that communication-based interventions yield stronger effects when integrated with complementary instructional approaches (Hall & Montgomery, 2023). Therefore, assertive training is best conceptualized as a *social learning enabler* that enhances the conditions for effective learning, rather than as a standalone instructional driver.

Effects of Game-Based Learning on Learning Outcomes

The results further indicate that game-based learning (GBL) exerts a stronger effect on learning outcomes than assertive training. This finding is consistent with self-determination theory, which highlights the roles of autonomy, competence, and relatedness in fostering intrinsic motivation (Ryan & Deci, 2020). GBL effectively addresses these psychological needs through structured challenges, immediate feedback, and sustained interactive engagement (Díaz-tejerina & Fernández-río, 2024).

Recent Scopus-indexed studies demonstrate that GBL enhances motivation, engagement, and higher-order thinking skills. For instance, Camacho-Sánchez et al. (2023) reported increased participation and cognitive engagement in physical education contexts. Similarly, Tortosa-Martínez et al. (2023) found that SDT-based gamification significantly improves intrinsic motivation and self-regulation. Meta-analytic evidence further indicates that elements such as immediate feedback and adaptive challenges enhance students' sense of competence and autonomy (Sailer & Sailer, 2021).

In physical education, GBL is particularly effective as it aligns with experiential learning principles, enabling students to learn through direct participation and real-time feedback (Frontiers in Education, 2025). This may explain the stronger direct effect observed in this study. However, the effectiveness of GBL is highly dependent on instructional design quality. Poorly designed game elements may result in superficial engagement or even demotivation, particularly when competitive elements are overemphasized (Sailer & Homner, 2020). Therefore, effective implementation requires a careful balance between challenge, feedback, and instructional relevance.

Interaction Effect: Toward a Synergistic Pedagogical Model

The most notable finding of this study is the significant interaction effect between assertive training and GBL, indicating that their combination yields greater learning outcomes than either approach alone. This supports the concept of *pedagogical synergy*, whereby the integration of complementary strategies enhances overall instructional effectiveness.

This synergistic effect can be explained by two interacting mechanisms: (1) assertive training enhances communication quality, social interaction, and collaborative behavior, and (2) GBL increases motivation

and cognitive engagement. Together, these mechanisms create a learning environment that is both socially supportive and cognitively stimulating (Bandura, 1977; Langford, 2005).

Recent research supports this integrative perspective. Manzano-León et al. (2023) found that gamification improves both cognitive outcomes and social skills when combined with social learning approaches. Likewise, Lampropoulos and Kinshuk (2024) demonstrated that integrating gamification with social interaction produces greater learning gains than single-strategy implementations. These findings suggest that the observed effect is multiplicative rather than merely additive.

The very large effect size observed in the integrated condition ($d > 2.0$) indicates substantial practical significance. However, this result should be interpreted with caution, as such large effect sizes are uncommon in educational research and may be influenced by contextual factors, including sample size, intervention duration, or measurement sensitivity (Camacho-Sánchez et al., 2023; Sailer & Homner, 2020). Further replication studies are therefore required to confirm the robustness of this finding.

Overall, this study demonstrates that instructional effectiveness depends not only on individual strategies but also on their integration. It positions assertive training as a complementary mechanism that amplifies the impact of GBL, particularly in socially interactive learning contexts such as physical education ((Herlinawati et al., 2024; Roshid & Haider, 2024).

Practical Implications

These findings suggest that assertive training should be embedded within instructional practices through structured peer interaction, reflective activities, and communication-based feedback. This approach ensures that social skills are developed within authentic learning contexts (Reith-Hall & Montgomery, 2023).

Additionally, GBL should be systematically designed to align with learning objectives. Game elements must support meaningful cognitive engagement rather than mere entertainment. Effective design requires a balance between challenge, feedback, and instructional relevance (Lampropoulos, 2024; Ratinho & Martins, 2023).

More broadly, the findings support the development of hybrid learning models that integrate cognitive, social, and emotional dimensions. Such models align with 21st-century educational priorities, including communication, collaboration, and critical thinking (Camacho-Sánchez et al., 2023; Herlinawati et al., 2024)

Limitations and Future Research

This study has several limitations. The quasi-experimental design restricts causal inference, and the single-school context limits generalizability (Tomlin, 2025).

Future research should adopt more rigorous designs, such as randomized controlled trials, and include more diverse samples across educational contexts. Further studies should also examine mediating variables, such as motivation, self-efficacy, and social interaction, to better understand the underlying mechanisms (Hernandez et al., 2008; Martin & Dowson, 2009). Longitudinal research is also needed to assess the sustainability of the observed effects, as short-term gains from gamification may not translate into lasting behavioral change(Sailer & Sailer, 2021).

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5. Conclusion and Implications

1. Summary of Key Findings

This study demonstrates that assertive training and game-based learning (GBL) significantly improve physical education learning outcomes among primary school students, both independently and interactively. GBL exhibited a stronger effect compared to assertive training; however, the most notable finding is the presence of a significant interaction effect, whereby the integration of both strategies resulted in the most optimal improvement in learning outcomes. The large to very large effect sizes observed in the integrated group further indicate that this approach is not only statistically significant but also yields substantial practical impact.

2. Contributions to Physical Education Pedagogy and Educational Research

This study provides important contributions to the advancement of physical education pedagogy, particularly in integrating social dimensions and active learning experiences within a unified

instructional framework. Theoretically, the findings support the principles of social constructivism and self-determination theory, demonstrating that optimal learning outcomes are achieved through the combination of effective social interaction and active student engagement. Moreover, this study enriches the existing literature by offering empirical evidence on an integrative instructional model (assertive training combined with GBL), which remains relatively underexplored in the context of primary education, especially within the domain of physical education.

3. Practical Implications for Physical Education Teachers

From a practical perspective, the findings suggest that physical education teachers should adopt more interactive, participatory, and integrative instructional approaches. Assertive training can be implemented through structured communication activities such as group discussions, reflective practices, and constructive feedback. Meanwhile, GBL can be applied through educational games that are carefully aligned with instructional objectives. The integration of these two strategies facilitates the creation of a learning environment that not only enhances motor skills but also fosters students' social competencies and motivation. Therefore, teachers are encouraged to design hybrid instructional models that balance cognitive, affective, and psychomotor domains.

4. Limitations and Future Research Directions

Despite its significant findings, this study has several limitations. First, the use of a quasi-experimental design limits the control over extraneous variables that may have influenced the results. Second, the study was conducted within a single-school context, which restricts the generalizability of the findings. Future research is recommended to employ more rigorous experimental designs, such as randomized controlled trials (RCTs), and to involve larger and more diverse samples. Additionally, further studies could explore potential mediating and moderating variables, such as learning motivation, self-efficacy, and social skills, as well as examine the long-term sustainability of the intervention effects. Such approaches are expected to provide a more comprehensive understanding of the mechanisms through which instructional strategies influence physical education learning outcomes

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Author Contributions

Imam Kusairi: Conceptualization, Methodology, Investigation, Data Curation, Formal Analysis, Writing – Original Draft.

Hariyanto: Supervision, Validation, Writing – Review & Editing, Project Administration.

I Wayan Wesa Atmaja: Resources, Visualization, Software, Writing – Review & Editing.

REFERENCES

Arufe-Giráldez, V., Sanmiguel-Rodríguez, A., Ramos-Álvarez, O., & Navarro-Patón, R. (2023). News of the Pedagogical Models in Physical Education — A Quick Review. *International Journal of Environmental Research and Public Health Review*, *20*(3). https://doi.org/https://doi.org/10.3390/ijerph20032586

Badau, D., & Badau, A. (2026). Humanities and Social Sciences Communications Article in Press Perceptions of the benefits and limitations of hybrid physical education lessons that combine virtual professors with an in-person professor TI ES IN ES. *Humanities and Social Sciences Communications*, *June 2025*. https://doi.org/https://doi.org/10.1057/ s41599-026-07125-y

Bailey, R., Armour, K., Kirk, D., & Jess, M. (2009). Research Papers in Education The educational benefits claimed for physical education and school sport : an academic review. *Research Papers in Education*, *24*(1), 37–41. https://doi.org/10.1080/02671520701809817

Bandura, A. (1977). Bandura (1977). *Psychological Review*, *84*(2), 191–215. https://doi.org/10.1037/0033-295X.84.2.191

Burgueño, R., García-González, & Abos. (2024). Students' motivational experiences across profiles of perceived need-supportive and need-thwarting teaching behaviors in physical education. *Physical Education and Sport Pedagogy*, *29*(1), 82–96.

Camacho-Sánchez, R., Manzano-León, A., & Rodríguez-Ferrer, J. M. (2023). education sciences Game-Based Learning and Gamification in Physical Education : *Education Sciences*, *13*.

Campbell, T., Gooden, C., Smith, F., & Yeo, S. (2022). Supporting college students to communicate

productively in groups: A self-awareness intervention. *International Journal of Educational Research Open*, *3*(October), 100213. https://doi.org/10.1016/j.ijedro.2022.100213

Casey, Ashley, Goodyear, & A, V. (2026). Can cooperative learning achieve the four learning outcomes of physical education ? A review of literature. *Taylor and Francis*, *67*(1). https://doi.org/10.1080/00336297.2014.984733

Díaz-tejerina, D., & Fernández-río, J. (2024). *El modelo pedagógico de educación física relacionado con la salud. Una revisión sistemática siguiendo las directrices PRISMA Health-based physical education model. A systematic review according to PRISMA guidelines*. *2041*, 129–135.

Diloy-peña, S., García-gonzález, L., Tilga, H., Koka, A., Abós, Á., García-gonzález, L., Tilga, H., Koka, A., Tilga, H., & Koka, A. (2026). Relationships between (de-) motivating teaching approaches with students ' need-based experiences and affective outcomes in physical education : a circumplex approach. *Physical Education and Sport Pedagogy*, *8989*, 1–26. https://doi.org/10.1080/17408989.2026.2612970

Dunton, G. F., Do, B., & Wang, S. D. (2020). Early effects of the COVID-19 pandemic on physical activity and sedentary behavior in children living in the U . S . *BMC Public Health*, 1–13. https://doi.org/https://doi.org/10.1186/s12889-020-09429-3

Elizabeth, S. T., Omura, A. M., Maguire, J., Levett-jones, T., & Stone, T. E. (2017). University of Newcastle Research Online nova . newcastle . edu . au. *International Journal of Nursing Studies*, *76*(November), 120–128. https://doi.org/10.1016/j.ijnurstu.2017.09.001

Ezeddine, G., Souissi, N., & Abaidia, R. (2025). Game-based physical education : a pathway to increased student motivation and greater learning outcomes. *Frontiers in Education*, *October*, 1–12. https://doi.org/10.3389/feduc.2025.1531651

Ferriz-valero, A., Østerlie, O., & Garc, S. (n.d.). *Gamification in Physical Education : Evaluation of Impact on Motivation and Academic Performance within Higher Education*. https://doi.org/https://doi.org/10.3390/ijerph17124465

Gutiérrez, D. (2013). Physical Education and Sport Pedagogy The effects of a sport education season on empathy and assertiveness. *Physical Education and Sport Pedagogy*, *20*(1), 37–41. https://doi.org/10.1080/17408989.2013.780592

Hall, E. R., & Montgomery, P. (2023). Communication skills training for improving the communicative abilities of student social workers : A systematic review. *Sage Journal*, *February*. https://doi.org/https://doi.org/10.1002/cl2.1309

Herlinawati, H., Marwa, M., Ismail, N., Liza, O., David, D., & Situmorang, B. (2024). Heliyon The integration of 21st century skills in the curriculum of education. *Heliyon*, *10*(15), e35148. https://doi.org/10.1016/j.heliyon.2024.e35148

Hernandez, L. L., Stiening, C. M., Wheelock, J. B., Baumgard, L. H., Parkhurst, A. M., & Collier, R. J. (2008). Evaluation of serotonin as a feedback inhibitor of lactation in the bovine. *Journal of Dairy Science*, *91*(5), 1834–1844. https://doi.org/10.3168/jds.2007-0766

Iglesias, D., Fernandez-rio, J., & Rodríguez-gonzález, P. (2023). Cooperative Learning in Physical Education : A Research Overview. *Apunts Educacion Fisica Y Deportes*, 88–93. https://doi.org/https://doi.org/10.5672/apunts.2014-0983.es.(2023/1).151.09

Kirk, D. (2005). Physical education, youth sport and lifelong participation: the importance of early learning experiences. *European Physical Education Review*, *11*. https://doi.org/10.1177/1356336X05056649

Koç, A., & Kanadlı, S. (2025). Effect of Interactive Learning Environments on Learning Outcomes in Science Education : A Network Meta - Analysis. *Journal of Science Education and Technology*, *34*, 681–703. https://doi.org/10.1007/s10956-025-10202-7

Lampropoulos, G. (2024). Virtual reality and gamification in education : a systematic review. In *Educational technology research and development* (Vol. 72, Issue 3). Springer US. https://doi.org/10.1007/s11423-024-10351-3

Langford, P. E. (2005). *Vygotsky's Developmental and Educational Psychology*. Psychology Press. https://doi.org/10.4324/9780203499573

Lehtinen, A., Kostiainen, E., & Piia, N. (2023). Co-construction of knowledge and socioemotional interaction in pre-service teachers ' video-based online collaborative learning. *Teaching and Teacher Education*, *133*(August). https://doi.org/10.1016/j.tate.2023.104299

Li, S., Ma, H., Zhu, L., Yu, H., Wang, A., Tang, X., Pei, R., & Piao, M. (2025). Exergame-Based Behavior Change Interventions for Promoting Physical Activity : Systematic Review and Meta- Analysis of Randomized Controlled Studies. *Journal Of Medical Internet Research*, *27*, 1–20. https://doi.org/10.2196/62906

Loon, A. W. G. Van, Creemers, H. E., Vogelaar, S., Miers, A. C., Saab, N., Westenberg, P. M., & Asscher, J. J. (2023). The Effectiveness of School - Based Skills - Training Programs Reducing Performance or Social Anxiety : Two Randomized. *Child & Youth Care Forum*, *52*(6), 1323–1347. https://doi.org/10.1007/s10566-023-09736-x

Luarn, P., Chen, C., & Chiu, Y. (2023). The Influence of Gamification Elements in Educational Environments. *Nternational Journal of Game-Based Learning*, *13*(1), 1–12. https://doi.org/10.4018/IJGBL.323446

Martin, A. J., & Dowson, M. (2009). Interpersonal Relationships , Motivation , Engagement , and Achievement : Yields ... *Review of Educational Research*, *79*(1). https://doi.org/https://doi.org/10.3102/0034654308325583

Martins, J., Varela, A. R., Costa, J., Onofre, M., Dudley, D., Cristão, R., Pratt, M., Hallal, P. C., & Tassitano, R. (2025). Worldwide Policy , Surveillance , and Research on Physical Education and School-Based Physical Activity : The Global Observatory for Physical Education (GoPE !) Conceptual Framework and Research Protocol. *Journal of Physical Activity and Health*, *22*(4), 444–456. https://doi.org/https://doi.org/10.1123/jpah.2024-0170

Murphy, R., Hennessy, E., Huggard, L., Booth, A., & Fitzgerald, A. (2024). A systematic scoping review of peer support interventions in integrated primary youth mental health care. *Journal Community Psychol*, *March 2023*, 154–180. https://doi.org/10.1002/jcop.23090

Parray, W. M., & Kumar, S. (2022). The Effect of Assertiveness Training on Behaviour , Self-esteem , Stress , Academic Achievement and Psychological Well-Being of Students : A Quasi-Experimental Study. *Science PG*, *3*(2), 83–90. https://doi.org/10.11648/j.rd.20220302.13

Patiño, A., Ramírez-Montoya, M. S., & Buenestado-Fernández, M. (2023). Active learning and education 4.0 for complex thinking training: analysis of two case studies in open education. *Smart Learning Environments*, *10*(1). https://doi.org/10.1186/s40561-023-00229-x

Ratinho, E., & Martins, C. (2023). Heliyon The role of gamified learning strategies in student ' s motivation in high school and higher education : A systematic review. *Heliyon*, *9*(August). https://doi.org/10.1016/j.heliyon.2023.e19033

Roshid, M. M., & Haider, Z. (2024). Heliyon Teaching 21st-century skills in rural secondary schools : From theory to practice. *Heliyon*, *10*(9), e30769. https://doi.org/10.1016/j.heliyon.2024.e30769

Sailer, M., & Homner, L. (2020). The Gamification of Learning : a Meta-analysis. *Educational Psychology Review*, 77–112.

Sailer, M., & Sailer, M. (2021). Gamification of in-class activities in flipped classroom lectures. *British Journal of Educational Technology*, *52*(1), 75–90. https://doi.org/10.1111/bjet.12948

Sanz de Acedo Lizarraga, M. L., Ugarte, M. D., Cardelle-Elawar, M., Iriarte, M. D., & Sanz de Acedo Baquedano, M. T. (2003). Enhancement of self-regulation, assertiveness, and empathy. *Learning and Instruction*, *13*(4), 423–439. https://doi.org/https://doi.org/10.1016/S0959-4752(02)00026-9

Schüller, I., Wergin, V. V., & Mess, F. (2025). Strengthening social skills : developing a social competence intervention for physical education using intervention mapping — protocol paper. *Frontiers in Psychology*, *February*, 1–13. https://doi.org/10.3389/fpsyg.2025.1484943

Sökmen, Y. (2019). The role of self-efficacy in the relationship between the learning environment and student engagement. *Educational Studies*, *00*(00), 1–19. https://doi.org/10.1080/03055698.2019.1665986

Tomlin, S. (2025). Estimating Causal Efects from Observational Data in Quasi-Experimental Designs. *Proquest*.

Wong, R., Mee, M., Pek, L. S., Syamilah, F., Yob, C., Camara, J. S., Derahvasht, A., & Nallisamy, V. (2026). Gamified socio-emotional learning for children : Insights from a thematic and co-word analysis of recent literature. *European Journal of Sustainable Development Research*, *10*(1). https://doi.org/https://doi.org/10.29333/ejosdr/17445

Yoshinaga, N., & Cooper, S. (2025). The four pathways of assertiveness : a multidimensional framework for enhancing individual well-being. *Frontiers in Psychology*, *1610807*(August), 1–12.

https://doi.org/10.3389/fpsyg.2025.1610807
Zahra, P. L., & Wangid, M. N. (2025). The Impact of Assertive Training Techniques on Enhancing Self-Disclosure Among Junior High School Students in Yogyakarta. *Al-Ishlah: Jurnal Pendidikan*, *17*(1), 1710–1717. https://doi.org/10.35445/alishlah.v17i1.5922